VOLUME XVII APRIL 1924 NUMBER 4

Southern Medical Journal

Journal of The Southern Medical Association

Published monthly by the Southern Medical Association, Empire Building, Birmingham, Ala. Annual subscription $3.00. Entered as Second-Class Matter at the Postoffice at Birmingham, Ala., under Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of Oct. 3, 1917, authorized Dec. 20, 1921.

SOUTHERN MEDICAL ASSOCIATION—Eighteenth Annual Meeting, New Orleans, La., November 24-27, 1924.

TABLE OF CONTENTS

MEDICINE—Internal Diseases, Pediatrics, Neurology, Diagnostic Methods, Etc.

Factors Regulating Cellular Growth and Their Importance in the Explanation of Cancer. Montrose T. Burrows, St. Louis, Mo. 233

Discussed by J. A. Lanford, New Orleans, La.; Charles H. McCollum, Fort Worth, Tex.; S. T. Darling, New York, N. Y.

The Nature and Significance of Chronic Intestinal Stasis. Julius Friedenwald, Baltimore, Md. 243

Some Important Etiological Factors in the Production of Cardiovascular Diseases. Noble P. Barnes, Washington, D. C. 252

Discussed by Maurice Pincoffs, Baltimore, Md.; L. T. Royster, University, Va.

Pyrexias of Obscure Origin in Children. Philip F. Barbour, Louisville, Ky. 256

Discussed by R. J. Estill, Lexington, Ky.; W. A. Mulherin, Augusta, Ga.

Further Observations Upon the Shadows of the Thymus and the Heart. L. R. DeBuys and E. C. Samuel, New Orleans, La. 260

Discussed by William Weston, Columbia, S. C.; W. A. Mulherin, Augusta, Ga.

TROPICAL DISEASES AND PUBLIC HEALTH

The Value and Uses of Complete and Accurate Vital Statistics. W. A. Plecker, Richmond, Va. 265

Discussed by F. M. Register, Raleigh, N. C.; Roy K. Flannagan, Richmond, Va.; George M. Kober, Washington, D. C.

SURGERY—Railway, Industrial, Gynecological, Obstetrical and Urological

Sterility: A Study Based On a Series of 526 Patients. Guy L. Hunner and Lawrence R. Wharton, Baltimore, Md. 269

Discussed by M. Y. Dabney, Birmingham, Ala.; E. H. Richardson, Baltimore, Md.; Mary Freeman, Perrine, Fla.; S. L. Jeffrey, Miami, Fla.; Guy L. Hunner, Baltimore, Md.

(Concluded on Next Page)

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TABLE OF CONTENTS—Concluded

Indications for Nephrectomy in Non-Malignant Diseases of the Kidney. Austin I. Dodson, Richmond, Va. 277

Discussed by Edgar G. Ballenger, Atlanta, Ga.; Guy L. Hunner, Baltimore, Md.; Chas. H. McCollum, Fort Worth, Tex.; R. Arthur Hooe, Washington, D. C.; J. Shelton Horsley, Richmond, Va.

Hemorrhages of the Later Months of Pregnancy. John Osborn Polak, Brooklyn, N. Y. 281

Discussed by Buford G. Hamilton, Kansas City, Mo.; Calvin R. Hannah, Dallas, Tex.

An Appraisal of Surgical Therapy in Peptic Ulcer. Horace Reed, Oklahoma City, Okla. 284

Discussed by Robert T. Miller, Baltimore, Md.; Arthur W. White, Oklahoma City, Okla.

EYE, EAR, NOSE AND THROAT

Technic of a Pan-Sinus Operation. Robert C. Lynch, New Orleans, La. 289

Diagnosis and Treatment of Inflammatory Disease of the Nasal Accessory Sinuses. Millard F. Arbuckle, St. Louis, Mo. 293

Papers of Dr. Lynch and Dr. Arbuckle discussed by G. B. Trible, Washington, D. C.; Virginius Dabney, Washington, D. C.; Lee Cohen, Baltimore, Md.; C. G. Coakley, New York, N. Y.; W. P. Reaves, Greensboro, N. C.; John J. Shea, Memphis, Tenn.; John H. Foster, Houston, Tex.

MISCELLANEOUS

Medicine As an International Influence. George E. Vincent, New York, N. Y. 298

EDITORIALS 300

The Etiology of the Toxemias of Pregnancy
The Mentally Crippled Child
The Physician in Politics

BOOK REVIEWS 303

SOUTHERN MEDICAL NEWS 303

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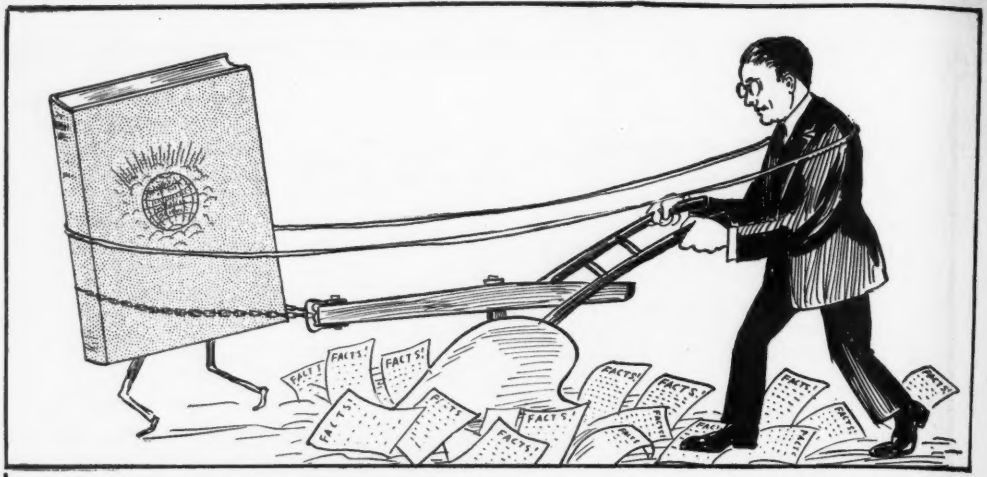

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CONTENTS VOLUME 1, INTERNATIONAL CLINICS, MARCH 1924

CLINICAL LECTURES

EXOPHTHALMIC GOITRE. By Lewellys F. Barker, Johns Hopkins University.

HEART DISEASE IN CHILDREN—INFANTILE CEREBRAL PARALYSIS. By J. P. Crozer Griffith, University of Pennsylvania.

ESSENTIAL HEMORRHAGIC PURPURA. By Nathan E. Brill, Columbia University.

SYMPOSIUM OF THE NEW-BORN

THE PROBLEMS OF PRENATAL, NATAL AND NEONATAL MORTALITY. By Prentiss Willson, Georgetown University.

INJURIES AND ACCIDENTS IN THE NEWLY BORN. By Wm. F. O'Donnell, Georgetown University.

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GENERAL DISEASES OCCURRING IN THE NEWLY BORN. By John A. Foote, Georgetown University.

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DIAGNOSIS AND TREATMENT

SURGICAL AND IRRADIATION TREATMENT OF BENIGN AND MALIGNANT GROWTHS OF THE UTERUS. By John G. Clark, University of Pennsylvania.

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SURGICAL TUBERCULOSIS OF THE SPLEEN. By J. L. Magnac, Versailles, France.

SOME ASPECTS OF MIGRAINE. By A. H. Gordon, McGill University.

A CASE OF HERPES ZOSTER IN THE DISTRIBUTION OF THE INFERIOR MAXILLARY NERVE ASSOCIATED WITH PARALYSIS OF THE FACIAL NERVE. By James Henry Lloyd and Blanche Elliott, Philadelphia General Hospital.

RECTAL DISEASES

TREATMENT OF ANAL, ANORECTAL AND RECTAL FISTULAE. By J. Rawson Pennington, Columbus Hospital, Chicago.

EXAMINATION OF THE FAECES. By Charles J. Drueck, Post-Graduate Hospital and Medical School, Chicago.

INDUSTRIAL MEDICINE

MEDICAL ASPECTS OF WORKMEN'S COMPENSATION LAWS. By Frank L. Rector, Secretary Conference Board of Physicians in Industry, New York.

INDUSTRIAL HEALTH SUPERVISION. By George M. Price, Director Union Health Center, New York.

MUTTER LECTURE OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

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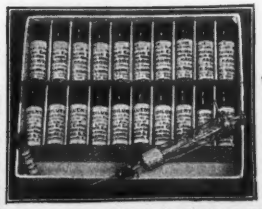

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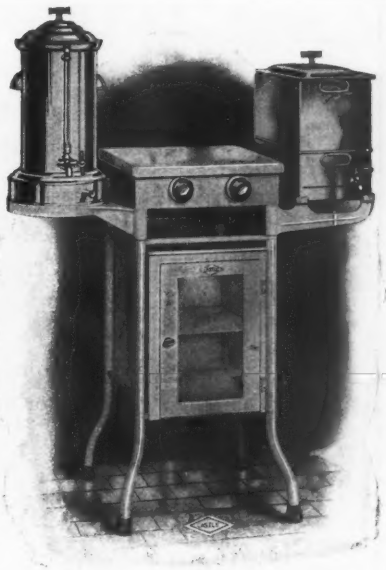

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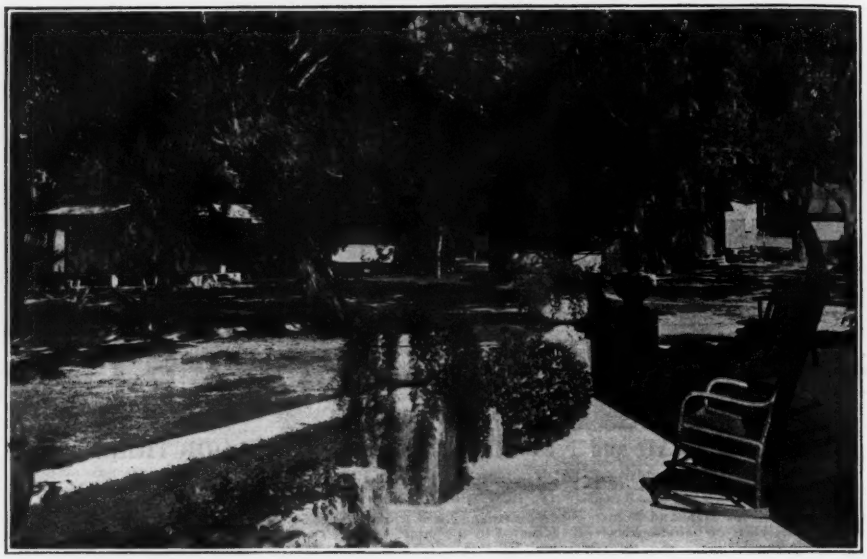

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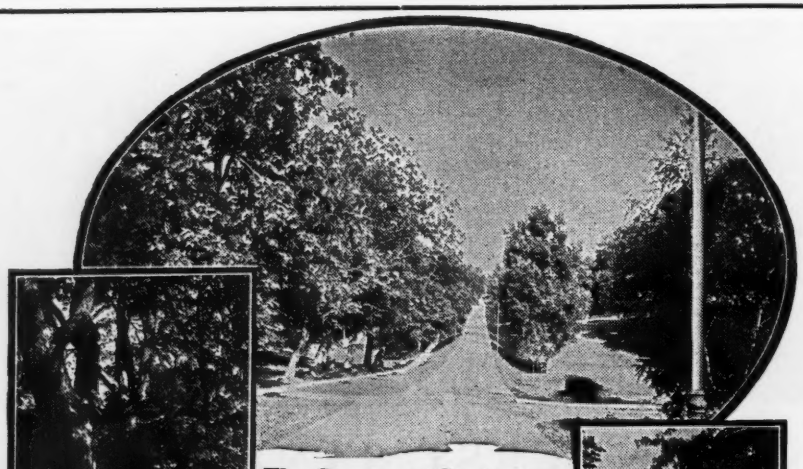

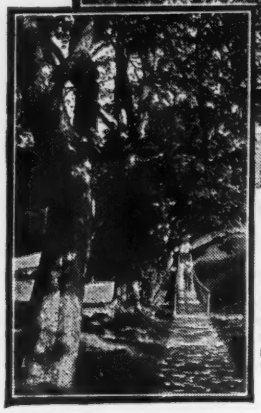

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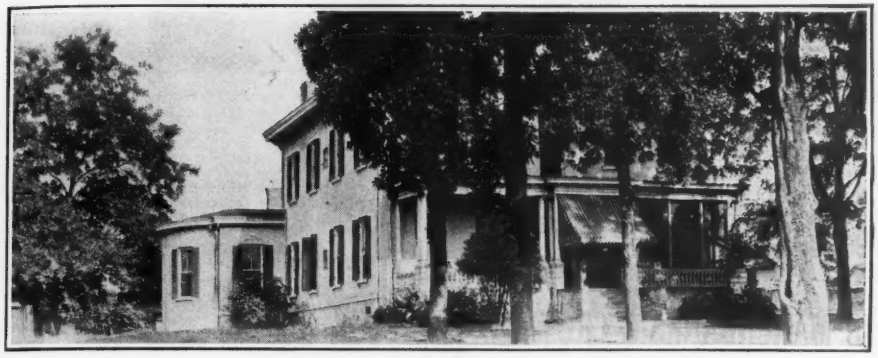

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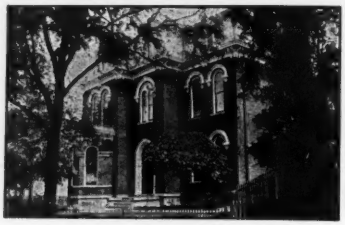

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Volume XVII APRIL 1924 Number 4

MEDICINE

INTERNAL DISEASES, PEDIATRICS, NEUROLOGY, DIAGNOSTIC METHODS, ETC.

FACTORS REGULATING CELLULAR GROWTH AND THEIR IMPORTANCE IN THE EXPLANATION OF CANCER*

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As has been pointed out in a previous article,[1] not only the earlier work on cancer but also the recent careful studies of this disease have indicated that its cure and control will not be solved alone through the identification of the conditions which lead to its production. Its solution will be the natural outcome of the eventual determination of the structure and metabolism of body cells. Cancer, unlike inflammatory processes, is not a reaction itself to certain irritating substances, but it is the result of a change either in the cell or tissue which when once established continues independent of the original causative agent or agents. It is an autonomous growth of certain body cells which continues like the growth of parasites to the destruction of neighboring tissues and organs and takes place at the expense of the nutrition of the whole.

This deduction is clearly indicated by earlier studies and more definitely proven by many recent investigations. These later clinical and experimental studies have shown that cancer may be induced by a variety of substances and conditions, such as coal tar, paraffin, other lipoid solvents, arsenic, certain animal parasites, the roentgen ray, radium, etc.; and that it may arise spontaneously in the course of the life of individuals of certain families of mice, and in certain congenital tumors and defects and in old inflammatory processes in man. If coal tar be painted on the skin of a rat repeatedly over a long enough time, cancer invariably results. This cancer once established, unlike inflammatory processes, then proceeds independent of the tar. Pieces of the tissue may be transplanted to other animals and so the disease may be propagated through many generations of animals. It is too late for the pipe smoker to discard his pipe after the cancer has developed. An irretrievable change has already been established.

The problem in cancer as it appears today is the same as it presented itself to many of the earlier authors. It is the problem of the general conditions which regulate cellular growth in the organism.

As is well known, an active independent growth of cells in the body is peculiar alone, under normal conditions, to the earlier periods of development. At first this growth is quite generalized. Later it becomes localized, first in one part and then in another. In man it ceases entirely with the laying down of the last kidney tubule and glomerulus at about ten days after birth. Subsequent to this time all growth is merely the enlargement of preformed organs and tissues. It is like the hypertrophies and hyperplasias of later life.

In later life it is again well known that hypertrophy and hyperplasia are related directly to the functional activity of the part. Increase the work of the heart, it grows. Decrease its activity, it atrophies. So, in the same manner, the removal of a part of any organ or another organ of the same kind leads to an active enlargement of the remaining parts. This enlargement continues to the re-establishment of a cer-

*Read in Section on Pathology, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

tain size which corresponds to the functional demand made upon the part.

As a moderate increase in the functional demands made upon an organ or a part is associated with the growth of that organ or part so further or excessive work is associated with a degeneration of these same cells. Such a degeneration is also seen in certain structures during development. The pronephros and the metanephros of higher animals suffer such changes as they give way for the development of the kidney.

Cancer represents a return of the property of independent active growth to certain cells, or rather to groups of certain cells in the organism. This independently growing tissue also suffers extensive degenerative changes in part. While the degenerations resemble ordinary autolytic changes, they differ from those seen in the infarct, for instance, in that they are not harmful for the organism. The disappearance of the pronephros or the metanephros does not disturb the nutrition of the whole. So it has been shown that large tumors may disappear in a few days without evident toxic symptoms to the animal.[2]

Closely associated with this loss of independent active growth in the developing organism marked morphological and chemical changes also take place in the tissue. The various cells peculiar to the different organs and tissues are differentiated. The blood vascular system develops. The cells become separated by a rich vascular network and by a deposit of extracellular reticular fibres, the connective tissue fibrils. In early embryonic life the cells are closely packed together. The number of capillaries per unit cell area is small. In later life one sees great variation in the number of cells per unit area in any tissue. In the most cellular tissue of this period all cells are closely beset with capillaries. The cells of the liver, for instance, are separated into columns no more than two cells thick. The circulation is active in these capillaries. This is in contrast to the slow, sinusoidal circulation of the embryonic liver.

Such an arrangement of cell peculiar to the adult is strikingly different, therefore, from the dense cell masses of cancer and early life. Cancerous tissue is peculiar not only in that it grows actively and independently of the whole or of any functional demand made upon its cells, but it again, like the tissues of early embryonic life, is a densely cellular tissue. It is peculiar not that its cells are like the embryonal cells—they are not—but that they are arranged in dense masses. They have lost in many instances the shape peculiar to them in the normal tissues. Otherwise they are not embryonal. The cells of the cancer of the skin are skin epithelial cells. So the cells of the sarcoma are connective tissue cells. The only demonstrable change they have suffered is in their arrangement, their ability to grow and their shape.

Cohnheim, like many older authors and a large modern school, has taken the view that this loss of independent growth of cells in early embryonic life is the direct result of some primary age-change in the cell. They have ignored largely the accompanying changes in the environment, the gradual separation of the cells by intercellular substance and blood vessels. They have considered that the loss of independent growth during development is the direct result of a differential change the cells suffer or that it is due to an aging of the cell. Cohnheim, therefore, introduced the view that cancers must always arise from embryonal cells which have lain latent in the tissue and have not suffered such age-changes. The failure to have found any proof of the existence of such cells has led other authors to believe that this active independent growth in cancer is due to a special differentiation in the cells, a hyperdifferentiation, for instance, in the sense of Robertson,[3] or otherwise. The coal tar and other specific substances act, therefore, only to change the general structure of the cell, to remove special inhibitors, or to bring about a special differentiation in these cells.

All attempts to prove these later ideas have also failed. Hanselman thought he had proven such a differentiation in the discovery of abnormal mitoses in cancer cells. Further careful studies have fully shown, however, that such abnormal mitoses are readily induced in any normal cells by merely changing the concentration of many stimulants capable of inducing normal divisions in these cells. Other studies of body cells have fully shown their fluid nature. This indicates clearly that their shape at all times is dependent upon their immediate environment. The difference in the shape of the normal cell from that of the cancer cell may be ascribed to a change in the general organization of the tissues rather than to any primary change in the cell. So in the same manner all other changes such as the change in the nuclear-cytoplasmic relationship have not been proven to be important. In fact, the better work of the last and this Century has shown quite clearly, as E. B. Wilson points out, that growth, differentiation and function are not determined by the cell, but by more general forces or stimuli active in the organism. Driesch showed when the first two blastomeres of the eggs of sea urchins are separated each will develop into a mature individual. He states:

"The relative position of a blastomere in the whole determines in general what develops from it; if its position be changed it gives rise to something different."[4]

As Wilson has clearly pointed out, cell-division in the organism at all times is determined by the environment and not the cell. He states that all evidence points to the fact that

"cell-formation is subordinate to growth, or rather to the general formative process of which growth is an expression."[5]

What these earlier authors failed to find is the nature of the conditions leading to each of these various changes that the cells may suffer. Driesch noted that the normal growth of an animal is related to a special form. He found that, when the gastrula of the sea urchin is bisected, each half does not grow at once, but only after each has reformed by a shifting of its cells into a perfect gastrula of one half the size. These observations of Driesch have been fully confirmed by Miss Bickford and Morgan for the regeneration of the hydranths of tubularians and for the regeneration of planaria from pieces of these animals. No growth takes place in the pieces until a perfect hydranth or animal of small size is reformed by a shifting of the cells.[4]

What Driesch failed to find were the conditions which led to the primary remolding. He looked at the remolding as the work of some vital force. That growth was dependent upon this primary remolding, or a special arrangement of cells, seemed certain to him.

The tissue culture has not only given more definite proof for the relation of the general organization of the animal or part to function on the one hand and growth on the other, but it has allowed us to analyze directly the nature of the environmental changes suitable for each form of activity. As I pointed out in 1913, and later in 1915, rhythmical muscular contraction develops only in a cell of the tissue culture which becomes stretched through a serum cavity between the tissue fragment or the surface of the medium and a band of elastic fibrin attached to its other end. If this same cell be simply transferred from this position to the side of the band of fibrin it takes on all the properties of a simple connective tissue cell. If it be laid near a cellular fragment about which the cells are growing it grows and divides actively and has all the appearance and activities of a sarcoma cell.[5 6 7 8]

So in the same manner, as I have pointed out in a recent paper, all functional activity in the organism can be related to an orderly laying down of extracellular materials, the connective fibrils, the basement membranes, the nerve and muscle sheaths, etc.[9]

That the shape of the cells and their general arrangement in the normal organism and cancer is to be related directly to the environment I was able also to show in the earlier work with the tissue culture. All cells suspended in a liquid round off to perfect spheres. These cells take shape only when brought into contact with surfaces and the shape assumed is directly dependent upon the shape of the surface of contact and other demonstrable forces in the culture.[10] This applies not only to the connective tissue cells, but to all types of cells. The connective tissue cells take a spindle shape in a culture medium of blood plasma, in that they are able to coagulate the plasma, form fibrin fibrils and stick to the side of these fibrils. Lymphoid and other wandering cells have no such property of fibrin formation. They cannot stick to fibrin formed by the connective tissue cells. They remain spherical or ovoid in shape when placed in the plasmatic medium. In the same manner the shape of the epithelial cells may be reduced to physio-chemical expression.[11]

In a medium of blood plasma, an environment strange for these glandular tissues, the epithelial cells rarely ever grow out as tubes. Carrel and I noted tubules to form about one fragment of thyroid, but in most cases the cells spread out as broad thin sheaths of cells like the epithelium of the skin. Champy, in 1919,[12] showed that if connective tissue cells be added to a culture of kidney the tubular formation will be regained in the epithelial cells of the culture. Drew, in 1923,[13] confirmed these observations of Champy.

All of these facts stand as direct proof of my earlier observations and indicate clearly that growth function and cellular shape are not changes related to the age of the cell, but its immediate environment. In 1915, I[14] again gave evidence to show that rhythmical contractions are not the work of any cellular machine, but that it is the response of the cell to a particular environment. In the same manner it seemed evident that an active independent growth may be merely another form of reaction that the cell may undergo in another environment.

As I noted above, the disappearance of the active independent growth of cells in the developing organism may be directly related to the separation of the cells by a rich vascular network and intercellular materials. Further studies of the process of rhythmical contraction in heart muscle cells have shown that this functional state is dependent not only upon extracellular materials arranged in a certain relation to the cell, but also upon an active circulation. In simple hanging drop cultures, where there is no means of interchange about the cells except by diffusion, the contractions of muscle cells become irregular. There are periods of activity followed by periods of rest. The active periods are ushered in by rapid strong contractions. These become weaker and weaker until they finally cease for a time. After a short or longer rest period they begin again.

If a stream of serum be passed over these same cells these irregularities cease. The cells

contract forcibly and continuously under such conditions until their supply of nutrition is exhausted. Stop this flow of serum and these irregularities appear immediately again.

Quite the reverse to this peculiarity of the functional states in the organism I have found, and noted in a recent paper,[15] that growth is inhibited by such a stream of serum passing over the culture.

For many years it has been known that increased functional activity in the organism is always associated with an increased circulation to the part. Growth, however, may follow a decrease in the circulation. The clubbing of the fingers with disturbances in the general circulation illustrates clearly this fact. In an unpublished paper on the circulation of the nail I noted that the circulation of the growing bed is very much less than along the whole of the outer parts of this structure.[16] The entire growth of the developing nervous system takes place along the central canal. The blood vessels invade the outer peripheral portions. In the light of these facts it may not be surprising, therefore, that the heart hypertrophies when it is overloaded, when its cavities are dilated and its walls compressed. Such compression of the walls must impede the circulation of the muscle fibres.

In the tissue culture I pointed out as early as 1913[17] [18] that the rate of growth activity of any particular tissue is directly proportional to the size of the fragments, provided fragments too large for oxygen to diffuse to all of their parts are not used. Single cells cannot grow in the cultures. Growth takes place always about fragments of tissues.

Again it has been noted that this growth and the whole metabolic activity of the cell is greatest about fragments of young embryonic tissue and fragments of cancer. In the cases of embryonic tissue this ability to grow decreases with age. It is less in extent about fragments of tissues of older embryos than about similar fragments of younger ones planted in the same medium. The cells from the older tissues not only show a decrease in ability to grow in the same medium, but this activity does not commence so early in the cultures about the older tissue fragments as about the younger ones. In direct proportion to the age and the decrease in activity, there is a corresponding increase in the latent period before any activity commences after the cultures are prepared.

At first I thought that these changes in relation to growth were to be related directly to an aging of the cells. It soon became evident that this was not true. It was not in any way related to the cell, but to the density of the cells in the fragments. If the cells in these younger embryonic fragments be carefully teased apart, and then washed with salt solution, their reaction becomes identical with the cells of older fragments in which the cells are normally separated in the same manner by intercellular material.

A further careful study of fragments of tuberculous granulation tissue has shown that the reaction of the connective tissue of the fragments in cultures is identical with the embryonic and adult cells of fragments having an equal cell content. Tuberculous granulation tissue, as is well known, varies in cellular content in different individuals and in different parts of the same mass of tissue. The cells react about the cellular fragments like those from equally cellular fragments of tissue of the embryos. About the more fibrous fragments this reaction is like the reaction of the cells from fragments of subcutaneous tissue in which the cells are equally separated by intercellular fibrils[1] and blood vessels. In the same manner the growth is more active about fragments of a cellular sarcoma than about the fragments of a fibrosarcoma, and this growth of the cancerous tissue, like that of normal tissue, is in every case proportional to the number of cells per unit area in the fragment and similar to a normal tissue having an equal cell content and vascular supply. The isolated cancer cell washed with serum or other isotonic solution reacts like any isolated normal cell. The difference between the cancerous tissue and the normal adult tissue is that the former is charged with products of the cell's metabolism, which have not been able to escape. The embryonic tissue is like the cancerous tissue except that it contains a greater amount of nutrient substances, the yolk. The embryonic cells will survive longer than the cancer cells in a medium of blood plasma which contains little or no nutrient substance.

In 1911, Carrel and I[19] had already shown that extracts of embryonic tissue and cancer contain an active growth stimulant. Drew,[13] at the Imperial Cancer Research Laboratory, has recently repeated and confirmed these experiments. When extracts of such tissue made in simple isotonic sodium chlorid solution are added to the medium of another culture the growth is greatly accelerated. It is interesting to note here that these same accelerating substances will accumulate in any fragment of older tissue if the fragments are cut off for a time from their blood supply and placed in the culture. This is well illustrated by the latent period noted in cultures of older tissue as well as in studies of extracts of any of these tissues. A study of the effect on other cells of extracts in salt solution of fragments of any normal adult tissue which has been removed from the body and placed for a time in a culture has shown that these fragments as they lay in the stagnant culture become slowly charged with these extractable stimuli or this stimulus.

While Carrel's and my earlier experiments had clearly indicated that the growth in cancer may

be the direct result of a stimulus, they led us nowhere, because they did not indicate the source of this stimulus. Thiersch and Beneke many years ago thought that tumor growth may be a degenerative overgrowth of cells. Oertel took a similar view.[2] Recently Drew claims that autolysing tissues contain a stimulus.

In my first paper on tissue culture, in 1911,[11] I showed that autolysis as it results from the absence of oxygen is in no way concerned with the growth process. Cellular growth is strikingly inhibited about fragments of nervous tissue so large that oxygen cannot diffuse readily to all of their parts. As I later showed, in 1913,[17] growth[18] is maximum only about the largest fragment into which oxygen may diffuse readily to all its parts.

Carrel's and my experiments showed that the substances which accelerate growth are soluble in simple salt solution. I find them also soluble in serum and plasma, or in the circulating blood of the body. As I noted above, growth is accelerated by cutting down the circulation. In tissue cultures the growth is greatest about the fragments which are placed in simple hanging drop cultures and are not disturbed. Simple shaking of the serum which accumulates on the lower surface of a hanging drop of plasma will disturb growth. It lessens it for a time.

Again, as I pointed out above, growth in the adult organism follows increased functional activity of a part. Such an increased functional activity is associated with increased metabolism or energy production in the parts. The energy for such functional activity in the body is derived from chemical reaction. Any increase in function means an increase in the products formed in reactions and a temporary increase of them in the tissues, even in the presence of an active blood supply. This active blood supply must soon relieve the tissue of these substances. Any decrease in the circulation, on the other hand, must lead to the accumulation of these products, even when the metabolic activity is low. In cancerous tissues and in tissues of young embryos these stimulating substances are always present. The tissues are characterized by a poor circulation in relation to the number of cells per unit area. They are characterized by dense masses of cells separating the blood capillaries. The cells in the older tissues of the normal organism are separated by a rich vascular network and intercellular materials. When fragments of cancerous tissues and tissues from young embryos are removed from the body and their circulation is destroyed they become active at once in the culture or within one or two hours after the cultures are prepared. Other tissues show no activity until after a long latent period. The length of this period is directly proportional to the original cell content and vascular supply of the tissues. Before the cells can grow the proper stimulus must accumulate. In my earlier studies, in 1913,[17] I[18] showed that oxygen is necessary for the growth of cells and further, as was noted above, that autolysis from lack of oxygen is decidedly harmful. In 1917 I[20] showed, however, that the amount of oxygen necessary for tissue activity is not great. Two years ago I[21] again gave evidence to show that the accumulation of the growth stimulus is absolutely dependent upon the presence of oxygen while the growth reaction itself is not dependent upon this gas. Fragments of young embryonic tissue will show a limited growth in the absence of oxygen. Older tissues demand oxygen in the same proportion as their latent period for growth increases in the presence of a normal oxygen supply. Drew's contentions of an autolytic source for these stimulants is entirely unfounded. His own experiments disprove this deduction. He extracted the stimulant from a kidney left for one hour in the incubator. This is not long enough for autolysis to set in.

The active stimulus for growth noted in cancerous and young embryonic tissues is the normal soluble product of the metabolism of the cells. These tissues grow because their cells are crowded together and removed from an active blood supply. They are free from the intercellular substances upon which the shape, the arrangement and the functional activity of the cell depends.

In the animal organism life does not manifest itself the same from the beginning to the end. In the beginning, it is represented by an active independent growth of undifferentiated cells. Only with the changing organization of the whole do differentiation and function make their appearance. The presence of an active independent growth of cells in early life is directly dependent upon the densely cellular character of the tissue and the limited blood supply. Its disappearance in later life is the result of the development of intercellular substances and a richer blood supply. Life maintains in this later period solely from the fact that these cells become polarized and assume other forms of work consistent with these changes.

As far as the growth of body cells is concerned, it does not differ qualitatively, therefore, in any way from that of the unicellular organism. As early as 1901, Wildiers[22] noted that when a few yeast cells are introduced into a large amount of medium containing all the necessary nutrient substances they will not grow. For growth to take place there must be a certain bulk relationship between the number of cells and the medium. Wildiers and others have shown that this is due to a decrease in the concentration of some substances liberated by the yeast into the medium. A few cells may be made to

grow in a large hulk of medium if an extract of yeast is added to the culture.

I have found that single cells of the body may be made to grow in the medium of a tissue culture if extracts of actively growing tissues are added to the medium. Embryonic extracts not only stimulate but prolong the growth. Cancerous extracts stimulate growth, but do not prolong it. They contain little or no nutrient substances.

Robertson[23] again recently, in 1921, noted that the same relationship exists in the case of the paramecium. The rate of growth at all times is directly proportional to the number of individuals per unit volume of medium until the medium becomes charged with waste products above a certain concentration. The same is known also to be true for bacteria. Webb, Williams and Barber,[24] in 1909, noted that a single tubercle bacillus or an anthrax spore introduced into a guinea pig or a mouse will not grow. Several must be injected to cause infection.

Devloo,[25] in analyzing the active substance noted by Wildiers in the cultures of yeast, came to the conclusion that it is either a phospholipin or is associated with or dissolved in lecithin. In my studies of these cells of higher animals I identified a substance liberated by body cells which is an active blood coagulant and otherwise has the physical properties of a phospholipin. This substance I have been able to show produces quantitatively the energy for migration and muscular contraction and combines to form the extracellular fibrils of connective tissue. In cellular growth it is formed in excess and disappears, so it may likewise combine in the reaction forming protoplasm or parts of the protoplasm of the cells. This is not the stimulating substance. The stimulating substance is soluble in salt solution. It acts, in low concentration, for the formation of the energy producing substances. In higher concentration, it acts to break down the proteins in the cell and destroy the cell. It is not a food. It is a part of the cell's mechanism for migration, a part of the cell's mechanism by which it digests its food and expands or grows, and it is the substance which destroys the cells when they become too crowded in a medium supplied with oxygen. It is not surprising, therefore, that in the more crowded areas of cancerous tissue the cells degenerate, and, in the less crowded areas, they grow actively. Again it is not surprising that this degeneration in the cancerous tissue does not liberate the same products as the autolytic type resulting from the absence of oxygen. In the normal body ample nutrient substances for such a growth are always present.

Again, there is no evidence that this stimulating substance combines in any of the reactions of the cell. It acts as a catalyzer of other reactions of the cell. Its action is wholly dependent on its concentration. Its concentration at all times is directly proportional to the rate of its production and indirectly proportional to the avenue for its escape by way of the blood stream. This substance is the normal product of that part of cell metabolism into which oxygen enters. The disappearance of an independent growth in the embryo is not due to any differential change in the cell. The differentiated cells of the organism may grow as well as those of early life. The disappearance of an independent growth in normal development is to be related to the development of intercellular materials and a rich blood supply. These structures lead to the rapid removal of the necessary stimulating substance as it is formed at all times in the tissues.

Cancer, therefore, may be nothing more than the result of any condition leading to a breakdown in the mechanical interrelation of cells and blood vessels peculiar to the normal animal. It may be the normal outcome of a proper disappearance of a part of the normal blood supply which may result from the action of any substance or condition causing the formation of a local dense mass of cells in any part or tissues where conditions are not suitable for this mass to develop intercellular substances and a vascular network sufficient to remove quickly the stimulating product of the normal metabolism of the cell.

CANCER

Ribbert,[2] many years ago, appreciated that differentiation at least as far as it takes place in most organs and tissues of the body, does not affect in any way the growth of the cells. As he states, the remarkable power for tissues to regenerate after injury completely rules out an age factor in the cells determining their growth. The growth in cancer Ribbert did not find, therefore, unique in any sense. He thought it could be nothing more than the response that any cell may undergo with the proper change in environment.

The difficulty which confronted Ribbert and the school which has followed him has been to find the nature of the environment suitable for this change.

The recent work on coal tar and tissue culture has opened paths for such analyses. The theories of Yamagiwa and Ichikawa,[26] although not completely proven by them, are epoch-making in the history of the study of this disease.

Fischer,[2] in 1906, showed that when drops of olive oil containing Scharlach R are introduced just beneath the epidermis they cause a rapid migration of epithelial cells to them. These cells surround the drops like a collar. Later

they proliferate and form a dense mass not unlike true cancer. Yamagiwa and Ischikawa later showed that if coal tar be applied frequently over a long enough time to one point on the skin of a rabbit these masses may reach a large size and metastasize like cancer. Woglom and Murray,[27] repeating their experiments, produced similar metastasizing tumors in mice. These tumors they found, when once established, could be transplanted through several generations of rats. The experiments have now been repeated by many others. One of the later series of experiments showed that this reaction takes place only about drops of tar having a high boiling point.

Ross[28] pointed out that those substances which in man have been shown to lead to cancer, such as paraffin, soot, coal tar, manure, etc., are active stimulants for the growth of cells. A more careful study by us of the action of many substances which lead to cancer has shown definitely that they lead either directly or indirectly to the production of a local dense mass of cells largely free from intercellular substance and poor in blood vessels.[1]

Jorstad,[34] working in my laboratory, has found that when a drop of coal tar is introduced on the surface of the skin or directly beneath the epidermis it occasions a movement of the epithelial cells toward it, a crowding, a primary degeneration, then an active proliferation of these cells and the formation of a dense mass. The action of a single drop of coal tar is limited. If more be added, more degeneration, movement and proliferation result. Finally an independent dense mass of growing epithelium is established. If the same coal tar be introduced into the subcutaneous tissue of an adult it occasions a movement of connective tissue cells to it, a degeneration of the cells and hyalinization of the tissue. If it be introduced into a more cellular connective tissue like that peculiar to the embryo and younger individuals, large numbers of cells are drawn away from their blood vessels and intercellular material and collected in a dense mass about the tar. In this dense mass these cells then begin to proliferate actively. The same is true for other lipoid solvents.

In the same manner the spirotera of Febiger[29] attracts cells. This parasite induces cancer in the stomach of rats.

On several occasions I have also encountered the larva of the cat tape worm in the livers of rats. This larva has been shown by Bullock and Curtis[30] to induce sarcomata in the liver of rats. The capsules formed by the liver tissues about this larva are strikingly different from those induced in man about the ecchinococcus, for instance. About the former larva the capsule is a mass of connective tissue cells free from intercellular substances. About the latter the capsule is a dense fibrous mass. Sarcomata do not develop about the ecchinococcus cysts.

These substances act, therefore, quite differently from those which produce inflammation. These latter substances produce primarily an exudate from the blood vessels. The cells react secondarily to organize and become scattered in the exudate. The cancer-producing substances act on the cells directly to attract them. The tissue built in the former case is a richly vascular tissue with a large bulk of intercellular substance. In the latter instance it is a densely cellular tissue poor in intercellular substance and in blood vessels.

Ross pointed out that it is not injury that produces cancer. It is the action of specific substances which induce the proliferation of cells. It is neither, according to our studies. It is the action of substances which attract cells to them, away from their intercellular material and blood vessels, so that there is formed a dense local mass free from ready avenues of escape for the soluble products of the normal metabolism of the cell.

A soluble stimulus placed in the tissue can have no such effect. It must escape by way of the blood stream. It is a viscid mass, which remains fixed and attracts cells to it, that acts this way, such as certain animal parasites, thick drops of coal tar, drops of olive oil, or better, olive oil containing substances like Scharlach R.

The exudates of chronic inflammatory processes attract cells to them, as Hertzler's studies have indicated, and the work of cultures has proven. In the body the same conditions are associated also with the development of blood vessels and the exudates become coagulated and deposited as extracellular fibrils between the cells. Primarily, these processes lead away rather than toward any cancerous process. The epithelial cells of the glands and other parts do not react readily to these exudates. They become first imbedded in the mass of newly formed connective tissue. Later the mass of connective tissue changes. The blood vessels become obliterated. The connective tissue becomes hyaline and the cells degenerate. With this change in the blood supply the separated epithelial-lined ducts suffer atrophy to a greater or less extent. At the same time their environment becomes more suitable, therefore, for an active proliferation. Carcinoma is a disease of old age. It develops frequently in the chronic inflammatory process of the breast and other organs. It develops in the epithelial cells of the skin which are undergoing atrophy. As is well known, the breasts of women and probably other tissues suffer periodic stimulation from the sex glands and other internal secreting glands. As is evident from the above laws of growth laid down, such atrophying epithelium must respond quickly to any cel-

lular growth stimulant, or as the culture experiments indicate, such a tissue may begin to grow independent of such stimulation. To prove this it became of interest to study the effect of a soluble stimulant upon tissues of adult animals. The stimulant used was the one produced by the tissue as noted above. It was extracted from the Jensen sarcoma with normal saline solution. The solutions of this stimulant were made sterile of sarcoma cells by passing them through a Berkefeldt filter. When introduced into the normal skin of an adult rat this solution has no noticeable effect. The stimulating substance is evidently removed by the blood stream. When injected into areas of skin suffering pressure atrophy this solution produces true carcinomatous proliferation.[29]

We have not investigated as yet the action of x-ray and radium. Members of families of mice which frequently develop cancer have also not been investigated. From the above observations it seems evident, however, that cancer may result from any condition or substance which can build a dense mass of cell in the organism, or from a sufficient reduction in the blood supply of any cellular tissue so that the growth stimulus may accumulate and the nutrition remain unchanged. The simple pigmented mole is such a mass of cells. These moles may become malignant after injury or disturbances in their blood supply or in the course of their normal development in the aging organism. Such age changes are associated with a decreased vascularity and atrophy of the superficial tissue. The relation between senile keratoses and cancer has long been recognized by dermatologists.

Further studies of the mechanism of cell division which have just been completed in the laboratory show that an orderly division of cells to form columns and to line the ducts of glands is directly related to the circulation and position of the blood vessels. Decrease this circulation and stimulate the cells they divide so as not to increase the circumference of the duct, but to fill the duct with cells. Thus dense masses of cells develop.

While it is true that many authors, such as Child,[36] have assumed that differentiation is the normal outcome of all cellular growth, it has been possible to prove very definitely that this is not true. The conditions which lead to a primary laying down of intercellular substances and a growth of blood vessels is something peculiar to the body and not the immediate process of growth in the cell. These changes are not the result of growth, but they stop the growth of the cell in the developing organism. In the fully developed organism and even evidently at a much earlier period this act becomes secondary, like growth, to specific stimuli. In all regressing tumors, as previous authors have shown, the cells do not degenerate. A general increase in intercellular substance, a fibrosis, marks the end of growth in many of them.[2]

Hertler,[32] in 1910, gave proof to show that the connective tissue fibrils are not secretion products of the cell, but simply transformed fibrinogen of the exudate of wounds. The tissue culture has shown very definitely that the fibrinogen acts as a special stimulant for the growth of endothelial cells of the blood vessels and migration of connective tissue cells. These cells coagulate the fibrinogen to fibrin and cling to it. There is no evidence that the connective tissue cells secrete fibrils at any time.[8] This fibrin is transformed into the extracellular connective tissue fibrils.

Such extracellular formations develop, however, only in areas where the stimulating substance noted above is in low concentration. Where it is formed in greater amounts the fibrin is digested. This stimulating substance, as I have noted above, is a product of oxydation in the cell. It acts according to its concentration. This concentration may be varied by preventing or accelerating its escape from the cells or by cutting down the oxidizable substances so less is formed.

As many of the earlier studies of development have indicated, this laying down of intercellular substances and differentiation in general is directly associated with the decrease in the yolk supply. If you cut the yolk into two, fully differentiated animals of half the size and with half the normal number of cells are produced. Gudernatsch[35] showed that if tadpoles are fed thyroid they will differentiate in a few days. Thyroid leads to a great increase in the metabolism and the burning of nutrient materials in the body.

The striking peculiarity of body cells which distinguishes them from the unicellular organism is not only their general organization which has to do with their growth and function, but their inability to take in crude materials from Nature and utilize them as food. These must first pass through a fully formed body.

The developing animal depends for its nutrition on the yolk and the mother. The yolk is formed by the parent body. In man, as in all higher animals, all the essential organs are formed before it is possible to remove the animal from its yolk or from its mother.

All my attempts to feed these body cells artificially, like bacteria, have failed. Extracts of embryos rich in yolk is the only food I have found capable of nourishing them.[33]

In a certain number of individuals, fibrosis becomes a striking feature of the later life. It is interesting that cancers do not develop actively in these individuals, but they tend to develop intercellular substance. It is in the young

healthy person that cancer quickly spreads beyond the bounds of the surgeon's knife and destroys quickly. It is in young animals that transplants of cancer take readily.

Any dense mass of cells once established either through a primary atrophy or secondary stimulation must tend in the normal organism to reproduce itself. This mass becomes parasitic to the host and continues in its growth to the destruction of the whole. Morgan[37] several years ago showed that an actively growing tissue may take its nutrition directly from the differentiated cells of the organism. Legs of salamanders regenerate as rapidly in starved as in well-fed animals. The starved animals, regenerating legs, suffer extreme emaciation and atrophy of their organs. In the normal organism an actively growing mass must receive ample food, produce ample of the stimulating substance and thus continue as such.

The cause of cancer may be, therefore, any substance or condition which can primarily build a dense mass of cells in the organism or cause a proper change in the blood supply to a cellular tissue. As early as 1913, I noted the direct relation of the number of cells per unit area in the fragment to their ability to grow in the cultures. Later, just at the beginning and after the War, I noted the relation of growth in cultures to a decreased circulation and the importance of oxygen for the development of the growth stimulus. Unfortunately, three years ago, in beginning to work directly with cancer, I became misled by a possible parasitic explanation of this disease. All experiments destined to prove such a parasitic origin have forced me back, however, to the conclusions cited above. It was only after these more direct experiments had progressed, however, that I realized that a very plausible explanation of this disease was in our hands.[1]

By these observations it has been possible to show, therefore, that an autonomous growth of cell is not the result of any primary change in the cell, but the direct result of a crowding of the cells and an orderly decrease in their blood supply. The stimulus for growth, other than food and oxygen, so well recognized by the earlier students of regeneration and cancer, is a product of the normal metabolism of the cell. The cancer cell is not different from normal cells. It is a normal cell reacting to a new arrangement of cells in the body. Cancer, therefore, for the first time becomes explainable in terms of the facts as they exist. To cure this disease this mass must be removed or destroyed, as it is today, or we must find some peculiarity in the growth reaction of these cells to attack. Its cure is not going to be solved by the application of the general laws which have held for infectious diseases, but through further careful analyses of the finer details of cellular structure and metabolism.

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DISCUSSION

Dr. J. A. Lanford, New Orleans, La.—The most interesting thing that I gathered from Dr. Burrows' paper was the conditions that he found would influence or occasion proliferation of embryonal cells as well as misplaced cells in the living body. I find it, though, rather difficult to understand why, if these cells are shut off from their circulating medium, they should get into the systemic circulation and produce secondary growths in distant parts of the body.

Another point that was shown with his tissue culture is that ordinary heart muscle could undergo a metaplastic change producing connective tissue and vice versa. This would tend to emphasize the fact that there is inherent in the embryonic cell some of the properties of the primary cell from which the tissue is derived, that it might under certain conditions produce a connective tissue, and under other conditions a muscular structure or any other type of tissue of that group.

Carrel and Burrows showed that the plasma from a rat which is harboring a new growth (sarcoma) is a more preferable medium for the culture or growth of that sarcomatous tissue *in vitro* than the plasma from a healthy rat of the same species. The inference is that there must be something in the individual's plasma that tends to stimulate the growth of these embryonal types of cells.

Dr. Charles H. McCollum, Fort Worth, Tex.—We must believe that there is something peculiar about tumor cells which is not entirely dependent upon the influence of the body of the host since they grow with much vigor when they are dislodged from their place of origin and may even be transplanted and grow in another host. It is difficult to believe that any mechanical massing of cells will bring about these and other extraordinary peculiarities with which we are familiar in the case of malignant tumors as contrasted with benign ones. That there may be great changes in the susceptibility of the host is equally well known, especially for the recent work on the effects of tar.

But many things lead one to the belief that the whole mode of growth and multiplication is morphologically and functionally different from that of normal tissues and the immunity reactions which can be produced by such growths against further transplantation serve to strengthen this belief.

A very interesting part of Dr. Burrows' paper was his discussion of stimulating substances which affect the metabolism of cells and are possibly concentrated about an implantation forming its growth. This seems a very promising line of investigation.

A Member.—It seems to me that these cells that are cultivated are not connective tissue cells, but cells which have been arrested in their differentiation and they have lost under surrounding conditions the property of going on and completing differentiation. Under the conditions which exist they are able only to perform functions in relation to themselves and not in relation to the body as a whole.

I have been comparing the tumors of men with the enlargements on trees, the so-called cedar growths, and I have been making some cultures. I have questioned whether any malignant tumors or any benign tumors, fibromata or adeno-cystomata, have a parasitic basis. In the case of the coal tar product an irritant is applied and you have to continue to apply the irritant to have the condition continued. It does not metastasize, and I question whether it could be considered a neoplastic disease. If these tumors are parasitic, either we have not recognized the parasite or we do not understand it and its life history. I question whether you can consider these cells connective tissue cells in the culture. They are cells which have been arrested in their differentiation.

Dr. S. T. Darling, International Health Board, New York, N. Y.—In regard to the question of the proliferation of metazoal cells as being due to an over-stimulation or the removal of some repressive substance, I should like to refer to an observation of mine made some years ago while studying a strain of Entamoeba histolytica. This strain had been carried along in kittens and after several removes bizarre changes were noted in the nucleus of the cells. These changes had been erroneously interpreted by Schaudinn as developmental in origin, but I was impressed with their resemblance to appearances seen in the nucleus of cells in malignant neoplasms, for there were evidences of rapid multiplication and degeneration. Here, either an unusual rate of multiplication due to stimulation, or unrestrained activities, brought about a condition analogous to a neoplasm.

Dr. Burrows (closing).—In my earlier studies I noted that the fixed tissue cells elaborate a substance during their migration which is an active blood coagulant. The whole movement of these cells is exactly proportional to the adsorption of such a substance by the medium. The action of this substance is manifested about fragments of mesenchyme of older embryos and fragments of connective tissue of adults. It does not appear at once, but after a latent period of several hours. It is manifested at its ap-

pearance by an active contraction of the plasma clot or by the formation of fibrin and serum. The mesenchyme and connective tissue cells move out in contact with the fibrin as it forms. This contraction continues to spread outward for a time, then ceases and with it the cells cease to move further.

When one uses fragments in which the cells are more densely packed as similar fragments of younger embryos, fragments of cellular granulation tissue or sarcomata this contraction commences earlier. It is more extensive and a film also forms along the surface of the medium. The cells move first into the clot and then in this surface film. They leave the clot for the film on the surface of the medium. Later growth and division intervenes. At this time the surface films may not increase, but the cells may grow and divide at the expense of materials in the film.

The plasma itself does not supply any nutrition for the growth of the cells or the necessary energy producing substances for the migration of these cells. The cells during migration lose materials and become exhausted. They supply their own energy for migration. The border cells of these more cellular fragments will migrate and grow in a nutrient free salt solution. The cells move out in the surface film, which covers the medium and makes it leathery. Nutrition comes, as I pointed out in previous articles, from disintegrating cells in the center of the fragment. This degeneration is not an autolysis in the true sense of the word. The degeneration without oxygen does not liberate nutritive substances. Nutrition is liberated from cells degenerating in a cellular fragment of sufficiently small size to allow oxygen to diffuse to all its parts. This degeneration is the result apparently of the accumulation of certain products of the normal metabolism of the cells. A normal salt solution extract of these tissues will cause in high concentration a degeneration of cells which lead to the production of nutrient substances. Growth synthesis like this splitting of nutrient substances depends again on a stagnation and concentration of normal products of the metabolism of these cells. The cells at the border of these cellular fragments are at first carried out into the medium as the cells degenerate in the center of the medium. As the medium becomes more saturated they grow and divide and then later also degenerate if they are not removed to a fresh medium. This degeneration may also be delayed by washing the culture with serum.

The question of metastases resolves itself around the question of the conditions which regulate migrations. It is interesting to note that in these cultures migration ceases in those areas where active growth intervenes. In the less cellular fragments or fragments having less concentration of the stimulating products of the metabolism migration alone intervenes. As the products of the metabolism accumulate in the cultures of the more cellular fragments the cells in the outer medium cease to liberate the coagulating substance and migrate. They grow and divide at the expense of the surface films from degenerating cells in the fragment. Whether growth or migration intervenes is wholly quantitative as far as the cultural experiments indicate. Degeneration like that seen in cancer of a non-toxic type is also merely the result of a greater increase in those products necessary for normal digestion and synthesis.

Through oxidation these cells liberate activators or substances which are necessary for the breaking up of food and synthesizing it. The isolated cells cannot retain these in concentration sufficient to perform these acts. They must accumulate about the cells. They are washed away by an active circulation. Stagnation and crowding is essential for them to grow. This is true also, as I pointed out, for unicellular organism, but not to the extent that it is true for body cells. Too great stagnation leads to the digestion of the cell itself.

The action of coal tar I have explained as the result of the absorption of it by the substances which lead to the migration of the cells. In recently published experiments we have found that large doses of coal tar lead to cachexia and death like cancer. Old masses of coal tar in the tissue also eventually migrate or metastasize by way of the veins to distant organs. Coal tar as we have seen it does not stimulate growth necessarily, but attracts cells to it away from their intercellular substances and blood vessels and forms dense masses which are suitable for growth to intervene.

Cancer cells in culture are not capable of so great a growth as embryonal cells. The embryonal cells are apparently richer in nutrient materials. Extract of cancer stimulates growth, but does not prolong it. Carrel has shown that the juice of embryos will prolong growth indefinitely in the cultures. Drew has failed to get any such prolongation of the life of the cells with the juice of cancerous tissue, and I have had the same experience.

THE NATURE AND SIGNIFICANCE OF CHRONIC INTESTINAL STASIS*†

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HISTORICAL

Much interest has always been manifested in the relation of certain intestinal affections to the production of a general toxemic state frequently termed autointoxication. Hurst[1] calls attention to the fact that Heller as far back as 1765 presented the view "that in constipation foul water was absorbed from the feces and

*President's Address, Southern Gastro-Enterological Association, meeting conjointly with Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

†From the Gastro-Enterological Clinic of the Department of Medicine, University of Maryland.

filling the blood with rancid parts produced fever, hemorrhage, consumption and insanity."

Following this period almost to the present day somewhat similar views have been held as to the nature of intestinal intoxication, though it cannot be maintained, that these theories have always been based upon scientific facts.

While Senator,[2] in 1868, noted that protein decomposition in the intestine was followed by the production of toxemia, it was not until 1884 that Bouchard[3] announced his theory of intestinal intoxication indicating that the degree of intestinal toxemia could be estimated by the quantity of putrefactive substances eliminated in the urine. The theory of auto-intoxication then became more and more popular as a means of explaining the many ills "that flesh is heir to" and even attempts have been made to destroy such poisons by means of the various so-called intestinal antiseptics, announced from time to time. Metchnikoff,[4] in 1907, by further developing the theory of auto-intoxication pointed out that premature old age was induced by the production of a toxemia in the intestinal canal due to certain pathogenic bacteria, which might be overcome by the implantation of harmless organisms and he therefore recommended milk impregnated with Bacillus bulgaricus. It was not long after, however, that Herter and Kendall[5] demonstrated the futility of this procedure, inasmuch as the bulgarian bacillus does not grow nor can it be propagated in the intestinal canal.

Although the term intestinal toxemia has ordinarily been held synonymous with constipation, this conception has by no means been able to go unchallenged. It must be admitted, however, that in general this theory is valuable as an explanation for many of the nervous manifestations due to chronic constipation. On the other hand, while constipation is the usual manifestation, diarrhea may exist as a prominent symptom in even grave forms of this affection.

Renewed interest again began to be manifested concerning the nature of intestinal stasis after the publication of Lane,[6] in 1913, who defined this affection as a delay in the passage of the intestinal contents to such an extent as to result in the production of an excess of toxic material in the bowel, which when absorbed in the circulation produced degenerative changes in every tissue of the body and lowered its resistance by the invasion of pathogenic organisms. According to Lane this condition is brought about primarily by the delay in the passage of the feces in the large bowel, and he attributed at least seventeen affections to this cause which he considered could be relieved by radical operative procedures on the colon.

Adami[7] a year later (1914), taking issue with the view promulgated by Lane, called attention to the absurdity of the term auto-intoxication as originated by Bouchard, in which he included both those poisons originating as a result of disordered metabolism and those due to invading bacteria. He points out that the poisons produced by invading bacteria are of intrinsic origin and cannot be classed as auto-intoxicants as such; for the contents of the bowel are actually outside of the body. Only those poisons are within the body which have penetrated through the cellular lining or surface membrane. According to Adami, therefore, the term gastro-intestinal intoxication is incorrect and should be employed only to a limited extent.

In 1900, Tissier[8] demonstrated that the meconium of the newborn infant is sterile, but that after it is breast fed for a few days the intestinal flora consists almost exclusively of the Bacillus bifidus. This organism can be obtained in almost pure culture from the feces as well as from the colon and continues its growth only as long as the infant is breast fed.

In 1900, Moro[9] described as aciduric organism the Bacillus acidophilus, commonly observed to a greater or less degree in the intestine of nursing infants. He at first considered it the predominating organism, but after closer study accepted the Bacillus bifidus as the predominating form. It was soon observed, however, that as the infant is given food other than that from the breast, the number of organisms of the Bacillus bifidus type becomes greatly diminished, while the Bacillus acidophilus forms are greatly increased in numbers, so that when breast feeding is discontinued the intestinal flora consists

almost exclusively of acidophilic organisms.

After breast feeding has been discontinued for some time, the Bacillus acidophilus becomes overshadowed by other organisms. In adult life but few of the acidophilic organisms can be obtained, as they have been replaced by many varieties of proteolytic bacteria.

Herter and Kendall,[10] in 1909, first noted the influence of diet on the character of the intestinal flora, demonstrating that by substituting a diet of milk and sugar for meat and eggs in animals, a proteolizing type was converted into an aciduric non-proteolizing form.

These observations have led to the more recent publications of Hull and Rettger,[11] Cannon,[12] and Rettger and Cheplin,[13] to which we shall refer again. It has been demonstrated that by the implantation of the Bacillus acidophilus the gas-forming putrefactive organisms gradually decrease in number and finally disappear, leaving a predominance of the Bacillus acidophilus forms in the bowel.

CLINICAL

As a conclusion from the observations just cited, chronic intestinal stasis may be defined as that condition in which there is a retention of the intestinal contents for a period longer than normal associated with toxemia of a more or less severe type. While the intestinal canal is so altered as to retain the material that should be excreted and there is more absorption than can be taken care of by the body, the secretions and poisons are forced into the intestinal tissues and in consequence the symptoms of intestinal stasis are produced. The factors which play a part in the production of this affection acting singly or collectively may be grouped as follows:

(1) Bacterial Invasion.

(2) Alteration in the Motility of the Bowel.

(3) Disturbances of Innervation of the Bowel and of the Endocrine System.

(4) Disturbances of the Intestinal Secretions with the Production of Various Lesions in the Bowels.

I. BACTERIAL INVASION

Attention has already been directed to the role played by the bacterial invasion of the bowel in the production of intestinal stasis and toxemia. From the time of the first appearance of Metchnikoff's[4] work "On the Prolongation of Life," in which he advocated the use of milk fermented with special strains of Bacillus bulgaricus, the greatest interest has been manifested in this problem with the hope that by alteration in the intestinal flora early changes in the tissues could be averted with a view of preventing the onset of old age.

Herter and Kendall[5] soon proved the fallacy of Metchnikoff's theory as to the possibility of the transplantation and colonization of the Bacillus bulgaricus in the intestinal canal, demonstrating that these organisms did not propagate in the intestine of monkeys fed on milk fermented with cultures of this bacillus. This fact has also been further proven more recently by Rettger and Cheplin[13] in their experiments on white rats as well as on man. In rats fed on large quantities of these organisms for a week or more, none could be demonstrated in cultures made at various portions of the intestine, twenty-four hours after the last feeding; nor in human beings following the ingestion of large quantities of milk soured with the same organism taken over a long period of time, could the Bacillus bulgaricus be isolated from the feces. The type of bacteria in the intestinal canal depends largely upon the character of the diet. The influence of a sterile diet upon the intestinal flora has been fully investigated by a number of bacteriologists. Sucksdorff,[14] in 1886, and Brotzu,[15] in 1895, observed that sterilized food reduced the number of bacteria in the intestine. This observation was not, however, confirmed by Escherich,[16] who demonstrated that the sterilization of food had little or no influence upon the growth of intestinal organisms.

It has already been noted that Senator,[2] as early as 1886, attempted to demonstrate that the decomposition of protein in the intestine resulted in the production of toxic substances. Herter and Kendall[5] (1909), however, were the first to demonstrate a definite relation existing between the character of the food and the intestinal flora.

A diet rich in animal protein produced an intestinal flora dominated by proteolytic putrefactive organisms while under a diet rich in carbohydrates the predominating organisms are fermentative or aciduric. It is therefore evident, as Bass[17] points out, that the intestinal canal is a "veritable culture tube" in which certain organisms thrive best in media consisting of large amounts of carbohydrates, while others require protein as their pabulum. In the first group are included the fermentative bacteria, in the second the putrefaction or proteolytic organisms. As a result of the proteolytic action, toxic substances are produced which are assumed to be the cause of the various forms of intestinal toxemia. That the proteolytic organisms may be potent factors in the production of intestinal toxemia has been demonstrated by Klotz,[18] who, by injecting cultures of typhoid bacilli into rabbits, was able to produce a definite form of arteriosclerosis, the lesion resembling in many respects that observed in old age. However, Bass[17] has drawn attention to the fact that the production of arteriosclerosis in animals by means of the toxin-producing organisms of the intestine is insufficient evidence that the absorption of these toxins from the intestinal canal is a causative factor in the production of the disease in man.

Among the varieties of infectious organisms noted in intestinal toxemias are the various types of colon bacilli and streptococci.

Attention has already been directed to the experiments of Rettger and Cheplin,[13] who demonstrated that by feeding with cultures of the Bacillus acidophilus the intestinal flora may be so altered as to convert it from a putrefactive proteolytic to a fermentative or aciduric type. A similar change may be brought about by means of feeding adequate quantities of lactose, with the result of a rapid increase in the Bacillus acidophilus forms and finally with a reduction to a very marked extent of the putrefactive bacteria of the bowel. According to Bass,[17] this change may necessitate, however, amounts from 300 to 450 grams of lactose per day in man; a quantity which could scarcely be continued over any great period of time. Bass[17] states that Coleman, during his studies on high caloric diets in the treatment of typhoid fever, had Torrey[19] prepare cultures of this organism (Bacillus acidophilus) to be utilized in the treatment of this affection. Rettger and Cheplin[13] demonstrated that by means of from 500 c. c. to 1500 c. c. of an acidophilus culture the intestinal flora is converted from the putrefactive type to one consisting largely of the Bacillus acidophilus form which may be continued indefinitely by means of this method of feeding. Similar results may be brought about by a combination of lactose and the acidophilus culture, each in lesser quantities. It is quite probable that, by means of this method of feeding, a change in the intestinal flora from the putrefactive to the aciduric type may be brought about and thus intestinal toxemia may at least to some degree be overcome.

Considerable interest has been manifested in connection with the problem of intestinal toxemia due to bacterial growth in its relation to the passage of various organisms from the intestinal tract into the blood stream, especially those varieties responsible for the production of chronic affections. Ravenel[20] and Ravenel and Hammer[21] were able to recover the bacillus of tuberculosis from the blood in animals fed upon this organism in a large proportion of instances. They also observed that in animals fed on fat at the time of the ingestion of the bacteria, a larger number of positive cultures could be obtained than in the fasting state. A similar conclusion was arrived at by Nicholas and Descas (quoted by Ravenel[20]), who demonstrated that the character of the diet played an important role in the permeability of the intestine to certain bacteria. On the other hand, Williamson and Brown,[22] in an elaborate experimental research, were unable to confirm these observations. After feeding with the Bacillus prodigiosus, they found it impossible to recover this organism from a fistula of the thoracic duct.

In association with bacterial infection in the bowel and its dependence upon the character of the food supply, the recent work of McCarrison[23] is of the greatest interest. This investigator, from his remarkable observations on the effect of diet on human beings as well as in animals, was able to produce by feeding with faulty

food over variable periods of time, various intestinal affections, especially serious types of colitis and of intestinal stasis. He calls attention to the fact that, due to this cause toxemia is produced, as can be demonstrated by the changes in the mesenteric glands. In consequence, impairment of the protective resources of the intestinal mucosa against infective agents takes place, which not only leads to infection of the mucous membrane of the intestine itself, but also allows the passage into the blood stream of micro-organisms from the bowel.

The role played by the administration of intestinal antiseptics is important as to the effect of these remedies in overcoming intestinal toxemia. This problem has especially attracted attention since the work of Bouchard[3] in 1887, who maintained that a reduction in the toxicity of the stools and urine could be brought about by means of the administration of iodoform, naphthalene and charcoal. More recently, Steele[24] (1908) arrived at the conclusion that the bacterial content of the intestine could be far better reduced by a regulation of diet than by means of antiseptics, while Friedenwald and Leitz,[25] in 1909, from experimental evidence, maintained that the regulation of the food and proper evacuation of the bowels presented a far superior method of overcoming excessive bacterial growth in the intestine. These results were confirmed by Harris[26] in 1912, and more recently by Dragstedt, Dragstedt and Nisbet[27] (1922). Up to the present there is extremely little evidence, therefore, to indicate that intestinal putrefaction and toxemia can in any way be overcome by means of the administration of so-called intestinal antiseptics.

II. DISTURBANCES IN THE MOTILITY OF THE BOWEL AS A FACTOR IN THE PRODUCTION OF INTESTINAL STASIS

Since the advent of the x-ray as a means of diagnosis in gastro-intestinal diseases much interest has been manifested in its application to the study of intestinal motility. Great credit is due Case,[28] who clearly demonstrated that the factors relating to intestinal stasis are in effect mechanical. He has also drawn attention to the fact that the terms toxemia and intestinal stasis are by no means synonymous. The ratio between the intestinal delay and the individual defensive power to eliminate and destroy toxins determines the degree of toxemia. According to this observer, every patient, however affected with an intestinal stasis, has a potential alimentary toxemia.

The factors revealed by means of the x-ray in determining the presence of intestinal stasis are malposition of various portions of the intestinal tract; spasticity of the bowel which is often associated with adhesions; cecal dilatation often associated with chronic appendicitis; ileocecal incompetency; various kinks or membranes as Lane's or Jackson's, and adhesions in various portions of the bowel (hepatic, splenic or sigmoid). In consequence of the delay in motility, low grade inflammatory processes take place in the colon with changes in the mucosa and the production of ulcerations, adhesions, low grade forms of peritonitis and disturbances in the mechanism leading to a further increase in the stasis.

Due to the various malpositions of the bowel, disturbances of the physiology are produced often to so great a degree as to occasion marked changes in the tone of the musculature of the intestine, a resultant increase in the bacterial growth, and toxemia of a more or less severe grade.

While the x-ray investigation must be held as a most valuable means of determining the motility of the bowel, we are in accord with the views of Smithies,[28] who cautions against the acceptance of this method of examination as an absolutely correct means of determining intestinal stasis. At times malpositions of the bowel as well as kinks and twists have but a slight effect upon its motility. Smithies,[29] too, considers the bariumized meal as an unphysiologic stimulus, inasmuch as the barium loses its suspending quality largely in the intestine and a considerable quantity of barium may lie as a foreign body in the bowel without producing any physiologic stimulation. On this account, only when clinical and objective signs of disturbances in the motility of the bowel are noted, can x-ray residues be relied upon as indicating mechanical defects in the bowel itself. Smithies advises the employ-

ment of carmin or charcoal for the estimation of the motility of the bowel by administering one of these dyes with the food and noting its first appearance in the stools. In many instances in patients affected with what was held as stasis, the conclusion reached was found to be erroneous, the dye having been evacuated at a perfectly normal rate.

Attention must be directed here to the work of Alvarez,[30] who points out that the symptoms of intestinal toxemia may be produced by mechanical distention of the bowel and irritation of the lower bowel by fecal masses. The fact that a patient is usually at once relieved by means of a bowel evacuation indicates, according to this investigator, that this condition cannot be caused by the absorption of toxins, which could not be sufficiently eliminated from the blood stream in so short a period of time. Further, Alvarez[31] has more recently called attention to the rhythmicity of the gastro-intestinal tract, which, according to him, is graded downward from the mouth to the anus: that is, the muscle segments nearest the cardia always show the greatest tendency to rhythmic contractions, while those from the pyloric region are slower in starting, indicating that the rate of contraction is greatest at the cardia and progressively decreases toward the pylorus. The same rhythmicity is present as a gradient throughout the whole bowel, progressively decreasing toward the lower bowel, and, according to this investigator, "this underlying gradient of tone might be the essential factor in determining the direction of peristalsis." According to this theory, stasis is not always due to a failure in peristalsis, but the gradient is here so altered by an unequal effect of the toxins on the muscle of the two ends of the intestine as to lead to this condition.

While it must be conceded that disturbances of motility play an important role in the production of intestinal toxemia, it scarcely seems possible that the mechanical conception is sufficient alone to account for the varied symptom complex observed in this affection.

III. DISTURBANCES OF THE INNERVATION OF THE INTESTINE AND OF THE ENDOCRINES

It is a well recognized fact that the nervous system plays an important role not only in the production of intestinal stasis, but is also frequently much involved as a result of this condition. If we recognize the involuntary nervous system as supplying two sets of nerve fibres to every organ, the one functioning as activator and the others as inhibitor nerves, it can readily be demonstrated how the two combined exhibit a regulating mechanism controlling the interactivity of both groups. In the first set we have the autonomic system as exemplified in the vagus group, the stimulation of which results in an increase in motility of the bowel. In the second set, we have the inhibitory fibres as found in the sympathetic system, stimulation of which inhibits spasm, causing relaxation and stasis. Intestinal stasis is therefore brought about, according to this theory, by a disturbance of normal balance between the autonomic (vagal) system and the sympathetic.

Cannon[32] has especially called attention to the effect of such emotional states as anger, fear and pain as inhibiting motility of the intestine by acting centrally upon the sympathetic nervous system, and stimulating it, while inhibiting the normal activating influences of the vagus, thus producing varying degrees of intestinal stasis.

According to Pottenger,[33] intestinal stasis, at least in part, is due to a disturbance in para-sympathetic innervation either as a general cell hyperirritability or a local parasympathetic reflex, the afferent sensory impulses coming in many instances from the gastrointestinal tract itself. As a result of the para-sympathetic reflex an uneven contraction of the musculature of the intestine may occur, which results in a disturbance of the normal movements of the bowel as well as of its secretion. Under these conditions it can readily be seen how, by the delay of ingesta through the intestine, decomposition takes place with the formation of toxins.

Keith[34] points to defective innervation in certain definite nodal areas in Auerbach's plexus with marked pathological changes in the nerve fibres as a cause of intestinal stasis. Others, however, as Mc-

Clure,[35] consider these structural changes late manifestations, resulting from low grade bacterial inflammatory processes.

Hurst[36] calls attention to inhibition of peristalsis in the terminal ileum and to spasm of the ileocecal sphincter due, as has been demonstrated by Elliott, to stimulation of the splanchnics, leading to stasis in this portion of the bowel. He points to instances of chronic intestinal stasis due to inhibition in which the constipation can be relieved by sedatives such as opium. This diminishes the influence of the sympathetic nerves on intestinal activity, and while purgatives are required in large amounts to produce any effect in this direction, small quantities are very effective if combined with opium, the stimulation of peristalsis being then increased, while the inhibition is diminished. According to this writer, a reflex inhibition leading to intestinal stasis may be produced by stimulation of sensory nerves, the efferent impulse being carried by the sympathetic nerves. Thus the discomfort and pain noted in cholelithiasis and appendicitis may reflexly give rise to stasis. In this connection it is of interest to note the experiments of Cannon and Murphy,[37] who demonstrated that crushing of the testicles in animals causes a cessation of the intestinal movements, which effect may be overcome by section of the splanchnics. It is a well authenticated fact that a blow upon the abdomen may cause an inhibition of intestinal peristalsis to such a degree as to cause death without any pathological findings being noted at autopsy. The well known experiments of Cannon and Murphy[38] indicate that post-operative stasis is frequently due to reflex inhibition produced by manipulation of the bowel, especially if there has been considerable traction on the mesentery.

The association between the endocrine glands and the vegetative nervous system in relation to the production of intestinal stasis is a matter of considerable interest.

It has been shown by Hurst[39] and others that the activity of the intestinal movements depends to a certain degree upon the stimulation of Auerbach's plexus by hormones formed from the intestine itself and that the internal secretions have a somewhat similar effect. Rolleston[40] has demonstrated that in cases of myxedema, thyroid extract may relieve the intestinal stasis, and it is a well observed fact that pituitary extract exerts a pronounced effect on the movements of the intestine.

While certain changes of the internal secretions are prone to produce disturbance in intestinal peristalsis, intestinal stasis on the other hand may aggravate disorders of the endocrine glands. Thus, according to Hurst,[41] inasmuch as the thyroid gland assists the liver in destroying toxins produced by the intestine, it is quite likely that the increased absorption of poisons due to intestinal stasis may induce certain pathologic changes in the thyroid itself. Bambridge,[42] too, has pointed out that in hyperthyroidism intestinal stasis should be eliminated as a possible etiological factor. He noted that in cases in which intestinal stasis had been overcome by means of operative procedures cure of the thyroid state was likewise effected.

While from these observations it is apparent that the nervous system with its relation to the endocrine system plays a certain role in the production of intestinal stasis, it is as yet not clear how far such influence is exercised in this direction. It is quite probable that this may be combined with other etiological factors, to a number of which we have already referred.

IV. DISTURBANCES IN THE INTESTINAL SECRETIONS WITH THE PRODUCTION OF PATHOLOGICAL CHANGES IN THE BOWEL

A further, and possibly the most important, source of intestinal toxemia may be noted in the disturbance of the secretions of the intestinal tract associated with focal infection from the wall of the bowel, ordinarily accompanied with bacterial decomposition of food. It appears evident that when the intestinal canal becomes so greatly disturbed as to retain its contents, which should be excreted, absorption becomes increased beyond that which can be taken care of by the body. The secretions and toxins pass through into the intestinal tissues and as a result typical signs of intestinal stasis and toxemia are produced.

Attention has already been directed to the investigations of McCarrison[23] who,

by feeding with faulty food over variable periods of time, was able to produce pathological processes in the bowel, such as colitis and intestinal stasis. He points to the fact that the health of the gastro-intestinal tract is dependent on an adequate provision of vitamins, an absence of which is capable of producing pathologic changes in the tract, the processes resulting being (a) congestive necrotic and inflammatory changes in the mucous membrane, (b) degenerative changes in the neuromuscular mechanism of the tract, (c) degenerative changes in the secretory elements of the tract; (d) toxic absorption from the diseased bowel as is evidenced by changes in the mesenteric glands; (e) impairment of the protective resources of the gastro-intestinal mucosa against infecting agents, due to hemorrhagic infiltration, to atrophy of the lymphoid cells and to imperfect production of gastro-intestinal juices. This impairment not only results in imperfections of the mucous membrane itself, but also permits of the passage into the blood stream of micro-organisms from the bowel.

Adami[43] points out that in consequence of intestinal stasis there results a low grade subinfection of the bowel. He demonstrated that the lymph nodes of the intestine of animals yield cultures of bacteria which are also present in the liver and kidneys. This is due to the fact that lymphocytes are constantly conveying small numbers of intestinal bacteria by way of the lymphatic system to the blood. In healthy individuals these never accumulate, as they are rapidly destroyed by the liver and spleen. When stasis occurs, however, an excessive number may reach the blood and collect in various parts of the body, and set free toxins where they destroy cells in the neighborhood and cause connective tissue proliferation.

In order that this condition may be brought about, according to Hurst,[44] an impaired vitality of the intestinal epithelium must take place and in consequence the symptoms of toxemia appear due to "disturbances of the first line of defense in dealing with poisons."

The wall of the terminal ileum and colon presents actual invasion by bacteria with more or less marked changes in the epithelial, muscular and peritoneal coats, which can be easily demonstrated according to Smithies.[28] According to this observer, not uncommonly as a consequence localized as well as diffuse peritoneal bands and adhesions are produced which lead to further disturbance of both the motor and secretory functions of the bowel.

Norman and Eggston[45] group intestinal toxemias into two types.

(1) Putrefactive toxemia
    (a) Indolic type with indicanuria.
    (b) Indolic type without indicanuria.
    (c) Butyric acid types.
(2) Pyogenic infective toxemia associated with focal infection of the bowel.

According to these observers, the pathological changes noted in intestinal stasis are hyperplasia of the intestinal chain of lymphatics; diffuse infiltration of the intestinal mucosa with lymphocytes, eosinophiles, plasma cells, and in some instances areas of polymorphonuclear infiltration forming small abscesses. In the more chronic cases, the submucosa is fibrous and reveals hyperplastic lymph follicles and diffuse infiltration of mononuclear cells. The muscular coat becomes next invaded and presents inflammatory infiltration with fibrosis and a partial destruction of smooth musculature. In consequence of the fibrosis a loss of elasticity of the wall of the bowel is produced, resulting in intermittent dilatation of the intestines and finally chronic dilatation with thinning of the colonic wall. The inflammatory process finally extends to the peritoneal coat, where it causes adhesions, and the passage of the infective substances to the spleen and liver. According to Norman and Eggston, pathological proof of these facts is found in the isolation of the bacteria in these cases from the specimens of the mesenteric glands. In the pyogenic infection toxemias, foci of infection form in the lymph follicles, Peyer's patches, intestinal nodes and intestinal mucosa. The protective secretions are so altered as to allow infection to gain lodgement in the ileum and colon.

Recently, Draper[46] has called attention to the extensive pathological changes observed in the colon following colectomy for chronic intestinal stasis. The speci-

mens were examined by Ewing, who reports very definite gross lesions. Pigmentation of the mucosa was noted as the most marked and constant lesion. It is recognized as a definite sign of chronic intestinal stasis. The next important change was the pouching of the intestinal walls. These pouches are from one to two centimeters deep with a tortuous entrance which prevents their emptying. The walls of these pouches are thinned and the mucosa eroded and ulcerated. Because of the destruction of the mucosa absorption of fluids and bacteria occurs.

The external surface of the colon has the ear marks of a chronic productive inflammation with the formation of dense fibrous tissue.

The loose serous coverings of the colon appear as thin membranes extending to the mesentery. These coverings frequently present diffuse opacities from the thickening bands and, according to Ewing, are probably caused by the lesions in the mucous membrane.

The chief defense against intestinal intoxication, according to Hurst,[44] occurs in the liver. All substances absorbed from the digestive tract must be carried to it before entering the general blood stream and one of its important functions is to overcome the toxicity of the various poisons. In this connection the fact that the liver may be active in and able completely to destroy indol is of some significance. The liver converts ammonium salts into urea and the products of protein putrefaction lose their toxicity to a large degree in the liver. Hence, when this organ is diseased or has lost its protective mechanism an excess of intestinal toxins reaches the circulation and severe intoxication may ensue. The enlargement of the liver so frequently observed supports the view of the protective mechanism of this organ and in consequence temporary or permanent changes may develop, notably cirrhosis.

There has been much discussion in the literature as to the chemistry of the toxic products developed in chronic intestinal stasis. It is generally admitted that the basic amins are pre-eminently the most important toxins produced by putrefaction of the several amino acids with loss of carbon dioxid. These putrefactive basic amins have a definite physiological action and are normally detoxicated by the liver. When this does not occur a more or less severe type of toxemia develops in the individual.

Herter[47] ascribes the toxic symptoms in intestinal stasis to indol, while Mutch[48] suggests that certain of these symptoms are due to the breaking down of histidin by bacterial action.

Hurst[44] maintains that it is quite possible that the symptoms are caused by the absorption of some still unknown poison.

Recently Lieb[49] has demonstrated that oxalic acid is another poison which is produced in the colon by the bacterial decomposition of sugars and which is readily absorbed and produces definite toxic symptoms even in small amounts.

According to Hurst,[44] intestinal toxemia is probably due rather to the abnormally long period during which the feces are retained in the intestine and to the consequent excessive absorption of poisons than to any increase in bacterial decomposition. Absorption occurs more rapidly the more fluid the feces, and in consequence there is a more rapid absorption of intestinal poisons. The most severe type of intestinal toxemia takes place according to this writer when stasis occurs in the terminal ileum, the cecum and ascending colon, the contents of which remain fluid.

Notwithstanding the varying degrees of intestinal intoxication observed clinically, there are no satisfactory methods at hand of estimating this factor. The methods of Jaffe,[50] who advocated estimation of the indican in the urine, and Baumann,[51] who advocated elimination of the amount of ethereal sulphates, present no indication of the degree of poisoning; for both indican and the ethereal sulphates may be present in abnormal amounts in the urine without excessive auto-intoxication being present and it has been frequently noted that severe intestinal toxemia may occur in the absence of any marked increase of these substances. The method of Bouchard[52] of estimating the toxicity of the urine and feces by determining the lethal dose when injected intravenously into rab-

bits has not been found reliable. Other methods utilized with a similar object in view have likewise been found unsatisfactory.

CONCLUSIONS

From a careful review of the various factors concerned in the production of intestinal stasis and toxemia, the conclusion must be drawn that the symptom complex of this condition cannot be explained alone on the basis of a mere mechanical conception of alteration in the motility of the bowel. Beside this factor there remains the question of bacterial invasion, disturbances of innervation of the bowel, and of the endocrine system; production of pathological lesions in the bowel; changes in the intestinal secretions and food decomposition with the formation of toxic products.

Which of these factors plays the most important role, it seems as yet impossible to determine. However, it appears in all probability that each exerts its special influence in the production of the condition, perhaps in a measure varying according to the degree of toxemia at hand.

Many problems concerned in the etiology of intestinal stasis and toxemia as yet remain unsolved. It will still require the best efforts of the pathologist, bacteriologist, biochemist; radiologist, gastro-enterologist and intestinal surgeon to solve this intricate and important problem.

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SOME IMPORTANT ETIOLOGICAL FACTORS IN THE PRODUCTION OF CARDIOVASCULAR DISEASES*

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Were it possible to select the parentage for many generations, the resultant offspring would be regarded as being "well-born," and might be born well, but it would not be infection proof, or immune to the influences of modern civilization. In this stage of human development, heredity, as a predisposing factor in the production of cardiovascular diseases, cannot be denied.

In addition to direct infection, the child

*Read in Section on Medicine, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

inherits congenital lesions or anomalies, cell weaknesses and tissue susceptibility that influence physical and mental growth and development, produce faulty metabolism, endocrine imbalance and hypersusceptibility of the central and vegetative nervous systems, and result in yielding an emotional and hyperesthetic type of individual given to arteriocapillary hypertonia, a predisposing factor in arteriocapillary spasm.

Should the child with inherited weaknesses escape infection, he may have a chance under proper living to overcome the defects. Quite as frequently, however, he becomes the delicate, neurotic youngster who has an unusually difficult time with the diseases of childhood and the various problems of life. He is often backward, cowardly, excitable, presenting defects, especially of the eyes, subject to various nervous explosions, disorders of digestion, cyclic vomiting, and periodical migrain. In my case records of cardiovascular diseases with hypertension and arteriosclerosis, sick headache in early adult life is one of the most constant notations.

Therefore, whether we consider tissue predilection, faulty metabolism, toxemias, or infections, the cause of cardiovascular diseases, the one principal factor in creating a predisposition or exciting the disease is infection. Directly or indirectly infection is responsible for a large majority of cases. The organism concerned in acute articular rheumatism and its cousin, the anhemolytic streptococcus, are most frequently found. With this view admitted it is not difficult to explain the tendency in certain families to rheumatism and cardiovascular diseases.

It should be stressed that rheumatism, especially in children, is a cardiac disease, that indications of infections are often observed in the heart in the absence of other lesions. This is especially the case when stiff, sore joints and muscles are called growing pains, chorea regarded as nervousness, decayed teeth as essential to the proper development of the jaw and infected tonsils and adenoids a condition the child can outgrow.

On account of the structural delicacy of the infant's heart, lesions are frequently undetected in the early stages of the disease. Later, with ensuing deformity, valvular adhesions and muscular compensation, the sounds become more audible. The wonderful recuperative power of the heart in early life has led many unobserving, or perhaps it would be kinder to say over-busy, physicians to regard heart diseases as rare in infancy and childhood; but careful observers who make heart examinations routine are familiar with the large number of crippled cardiac conditions in childhood.

Many of these cases are the result of unrecognized or poorly treated attacks of rheumatism. Possibly 75 per cent of organic heart diseases in children are associated with so-called rheumatic manifestations. It is well, therefore, to be possessed with the belief that rheumatic fever is less a disease of the joints than of the heart, and that heart damage cannot be estimated by joint involvement. The heart should be the primary consideration and the disease must be early recognized, early and persistently treated.

The pneumococcus is a frequent cause of endocarditis in infancy. Scarlet fever may have a complication of carditis at any age. Influenza bacilli, hemolytic and other types of streptococci, staphylococci and gonococci are organisms frequently found in the heart at autopsy. In sub-acute and chronic forms of carditis the anhemolytic streptococci, usually called streptococci viridans, that gain entrance most frequently through points of focal infection, are found in a tremendously large majority of the cases.

Congenital cardiac defects afford less resistance to bacterial invasion and a valve previously damaged is most frequently the seat of a sub-acute or chronic form of inflammation, while the organisms of rheumatism and syphilis readily attack previously healthy valves. In short, any organism that gains entrance to the blood may cause cardiovascular disease. This emphasizes the importance of early and effective treatment of all infections and

bacterial diseases of infancy and childhood, the prompt attention to all wounds and the removal of all focal infections. Septic bronchitis, osteomyelitis and furunculosis should not be neglected by expectant treatment, and tonsils, adenoids, sinuses, teeth and other primary foci that can be reached should be cleaned out without delay. The study of tissue affinities and specificity of micro-organisms will often aid the investigator in locating the seat of infection and the character of organism present. Injection of a larger than treatment dose of a polyvalent streptococci vaccine is of value in locating obscure foci of infection.

Constitutional heritage, common in many families, is demonstrated by the idiosyncrasies or the hypersensitiveness of these individuals to certain foreign substances. Expression of food sensitization is frequently seen in gastro-intestinal, genito-urinary, respiratory, nervous or skin disorders. The effect upon the cardiovascular system is not always observed, but the influence is there especially affecting the capillary system. Chronic alimentary allergy and abnormally acid dietaries directly or through their effect upon metabolism are factors in the production of many disorders that induce circulatory imbalance and are thus concerned in effecting vascular, renal and cardiac disorders.

Toxins of chemical, bacterial, metabolic or any other origin are factors in the production of cardiovascular diseases. They exert their influence directly upon the cardiac mechanism or indirectly through the vegetative nervous system, the glands of internal secretion, or the arteriocapillary system. The affinity of nicotin, caffein, some cardiac drugs, and the toxins of infections like diphtheria or influenza, for certain structures of the heart are generally recognized and accepted facts. The influence of hyperthyroidism on the cardiac mechanism is a good example of the effect of a special toxin. In brief, an excess of thyroxin elevates basal metabolic rate, accelerating general metabolism and increasing cardiac action. Excessive myocardial metabolism produces myocardial irritability and degeneration associated with muscle fatigue and instability of nerve current as shown by arrhythmia and auricular fibrillation. This circulatory imbalance lessens the nutrition of the heart and there is further lowering of the muscle strength and tone resulting in cardiac dilatation and insufficiency. Myocardial damage is progressively shown by sinus arrhythmia, premature contractions, paroxysmal tachycardia, auricular fibrillation and flutter, heart block, angina, and finally decompensation. It will be encouraging to note that early and careful examination of the heart, especially with electro-cardiogram studies, will often reveal evidence of embarrassment and fatigue caused by toxins with no permanent structural injury, as the removal of the toxin or source of the toxin enables the heart to regain its normal action.

Toxins, nervous tension and emotional explosions have an indirect effect upon the heart through their action upon the small blood vessels. This action may be local or transmitted through the vegetative nervous system. In either event the vessel dilatation or constriction may be excessive or prolonged. Some toxins, like some drugs, have a double action and an initial dilatation is followed by a contraction of vessels and vice versa. Toxins frequently cause hyperthyroidism with corresponding vessel dilatation due to the activity of the thyroid gland. This liberation of thyroxin is more or less spasmodic and during rest periods a reaction occurs and the now active pituitary and adrenals assist in inducing vessel contraction. The individuals thus affected are subject to nervous explosions, often accompanied with a functional inactivity of the kidneys due to spasm of minute vessels in the kidneys.

Recovery from these neurotic attacks is associated with relaxation of the vessels and the characteristic outpouring of large quantities of urine, as observed by Sydenham in 1680, when he wrote:

> "An urine as clear as rock water, and this hysterick women evacuate plentifully, which I find by inquiry is in almost all the pathognomonick signs of this disease which we call hysterick in women and hypochondriack in men."

Vessel stretching and vessel spasm repeated and continued, with an endotheliotoxin capillaritis, I venture to suggest causes arteriocapillary fibrosis. This con-

dition is naturally followed by hypertension and corresponding cardiac hypertrophy. Arteriocapillary fibrosis in the terminal branches of the arterial system is demonstrable before lesions occur in the kidneys and therefore cannot be regarded as an end product, but the result of a well-defined pathogenesis, a local manifestation of a general capillary and vascular disease. Hypertension thus established becomes a most important element in cardiac disease for the damage to the heart mechanism is always found in the chambers doing increased work.

New findings in physiology enable us more readily to understand this peripheral force concerned in the production of cardiovascular diseases. Capillary activity, formerly regarded as controlled by arterial activity, is now known to be governed by Rouget's cells. These are fine branching muscle cells encircling the capillaries near the arterioles, supplied by the sympathetic. Stimulation of the nerve causes capillary contraction, and section of the nerve causes dilatation. This is illustrated in arterial sympathectomy for the relief of Buerger's disease. This so-called thrombo-angitis obliterans is a local manifestation of vessel spasm found in a highly neurotic type of individual.

The microscopic study of capillary vessels and their action has opened a field for investigation that is proving both interesting and instructive. We will soon have dependable data concerning the action of drugs, diseases, toxins and nervous impressions upon these important single track blood vessels. Though the microscopic study of capillary action is new, the macroscopic observations of the resulting phenomena have been common knowledge since the days of Hippocrates. The pale, pinched face of shock is recognized by the layman and the flush of excitement and embarrassment requires no trained eye to interpret. It was poetically expressed by Donne:

"Her pure and eloquent blood spoke in her cheeks,
and so distinctly wrought,
That one might almost say her body thought."

Normal circulation is maintained by an active tissue demand for oxygen to draw the red cells through the capillaries, as well as a normal cardiac action and a normal blood vessel tone. These blood vessels under control of a complex nervous mechanism can be disturbed or influenced by a great variety of causes. Few individuals have a perfect circulatory balance and many have imperfections inherited or acquired. It is quite true that mortality in infancy has been diminished and by this many weaklings that previously died live to join the great class of those with cardiac diseases. Better types of children are born of younger parentage, and social conditions at the present time prevent early marriages. Belated marriages result in a diminished birth rate and it can be expected that children of older parents will not be able to shake off the tissue proclivities and endowments incident to a life of more or less dissipation. Modern civilization with its educational requirements, ambitious endeavor, mental worry, limited relaxation, crowded civic centers, improper food and feeding, society demands and social hypocrisy, makes for an existence requiring forced speed and inducing premature wear and tear upon the human mechanism, that it is undergoing evolution from natural laws and natural living to artificial laws and artificial living. There will always be inherited tendencies to endocrine disturbances, susceptibility to focal infection, hypersensitiveness to foreign substances, food sensitization, and faulty metabolism. There will be those whose children's children will have "rheumatic conditions," "apoplectic habits," hypertension and various types of renal diseases and cardiovascular degeneration. If these and all the vices and follies of mankind could be eliminated, the duties and necessities of life would ever be a fruitful source of ailment. Cardiovascular diseases, to a large extent preventable, will always be with us.

Briefly, more attention should be given to constitutional heritage and to the children of parents having "rheumatism" and cardiovascular diseases.

More attention should be given to infections and bacterial diseases of childhood, with especial reference to their complete recovery, and the detection and removal of all foci of infection.

More attention should be given to the causes of capillary spasms and hypertension, with especial reference to defects of infancy and childhood, endocrine and reflex disturbances, auto- and intestinal intoxications.

More attention should be given to educating the laity in regard to the causes of cardiovascular diseases, and in the importance of keeping well; of the need of proper relaxation and recreation, as well as the need of proper work, exercise and living.

DISCUSSION

Dr. Maurice Pincoffs, Baltimore, Md.—In the diagnosis of cardiovascular disease we should always include a mention of what seems to us the etiological type concerned, because by a study of etiological types of the disease we shall do more to forward our clinical knowledge of the prophylaxis, clinical course, complications, and prognosis of cardiac disease, than by any other single study of these disorders. As a simple classification of the major etiological types I prefer that which was put out by the cardiac clinics in Boston: the arteriosclerotic type, the rheumatic type, the syphilitic type, and the true hypertensive type. Each has its own favorite age period, its own peculiar tendency to certain complications, and its own prognosis. I wish to stress the value of studying clinically these very distinct major etiologic types.

Dr. L. T. Royster, University, Va.—Obviously I can discuss only the part of the paper that refers directly to children. Focal infections are just as important in young life as they are in adult life and should be sought for as carefully and removed as radically. Focal infections occur in children in the ear, in frank, open or latent mastoid with or without otitis media, and in the sinuses. Do not forget that your earlier teaching in anatomy as to the absence of sinuses in young life is apt often to be misleading. But to come specifically to the part of the anatomy which is affected most directly in child life in this condition, it is resolved in its last analysis into cardiovascular disease in infants and young children, and virtually narrows itself down to endocarditis. Acute endocarditis may occur in the course of any infection in the body. Our friends in England write a great deal about articular rheumatism in children, also in New England to a lesser extent and on down through the United States until we come to the mild climates. In twenty years I have seen only two cases of articular rheumatism in children. I shall pass over the question of growing pains as being probably rheumatic. They are not as marked as they once were.

I have not seen for at least ten years a case of endocarditis which did not practically immediately follow follicular tonsillitis and that is what I wish to stress in my few remarks. Follicular tonsillitis may be so severe as to cause a temperature of 104 or 105 degrees, with chills, or it may be so slight as to be hardly noticed. However, when you have reached the child suffering with acute endocarditis and see the receding inflammation in the pharyngeal area, you may assume pretty accurately that an acute follicular tonsillitis has preceded the attack. A chronic tonsillitis occurs often, and any tonsil that has obliterated follicles and adherent anterior pillars has been an inflamed tonsil. Personally I feel that every child that has tonsillitis should be kept in bed well past the stage of decline of fever because that is the best precautionary measure to prevent endocarditis. I feel that no child should ever be allowed to have a second attack of tonsillitis. When we realize the fact that a very large proportion of the decompensating hearts in the adolescent child and even in the young child are caused by an endocarditis somewhere between the third and tenth year, and that in the opinion of most pediatric observers today the tonsil is to blame, I am almost ready to say that I wish every tonsil could come out before it had its first attack of tonsillitis.

Dr. Barnes (closing).—I am sorry that some one did not take up in the discussion one of the etiological factors mentioned in my paper. This is the second time I have brought up the matter of capillary spasm causing a cardiac condition. Further thought and discussion is evidently needed before the profession will accept or discard the suggestion.

PYREXIAS OF OBSCURE ORIGIN IN CHILDREN*

By PHILIP F. BARBOUR, A.M., M.D., F.A.C.P., Louisville, Ky.

The term obscure must be taken in a relative sense for that which is obscure to one man may be more or less obvious to another of larger or different experience.

Fever is itself a phenomenon of Nature which is as yet quite unexplainable. It is not merely a question of heat production for violent exercise and other factors may increase heat production. Heat dissipation must be in exact proportion to heat production and must be under perfect coordination in order that normal body temperature be preserved. But physiologists are not quite agreed on the method by which this control is maintained nor is there adequate explanation of the ra-

*Read in Section on Pediatrics, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

tionale of increased heat production in fevers. There is some disarrangement between the production and dissipation of the heat engendered, so that the body temperature remains higher than normal. But why Nature fights infection in that way, or what particularly is accomplished by the high temperature, is a matter of doubt. It is thought by some that antibodies and other defensive processes are aided by the elevation of temperature, though this may be due to other factors. However unexplainable fever may be, we know that it causes great destruction of the proteins and eventually of the fats of the body, that it follows infections of various kinds of organisms, or the absorption of toxins from such organisms, and that many diseases will have quite characteristic temperature pictures which will aid in proper diagnosis. The very regularity or irregularity of the temperature range is oftentimes quite suggestive. But there are times when a low type of fever, irregular or persistent, will offer a difficult diagnostic problem. It is not possible in the limits of this paper to discuss all or even many of these cases, but they are sufficiently annoying and taxing to merit attention.

Intestinal toxemias are common causes of fever and constipation is considered by the laity as the chief offender. At times a brisk purge will arrest the febricula, so called. What the special agent may be that causes the fever is often not ascertained. But sometimes it is a difficult matter to secure thorough elimination or rather to secure the elimination of the thing causing the fever. The odor of the stools and of the breath, the appearance of the tongue and the indicanuria may be indicators of the intestinal condition. Blood and urine may be negative and you may be convinced that the intestinal tract is responsible. Yet a week or more of active purgation and colonic douching, etc., may be required before the materies morbi is passed. So do not give up the diagnosis too soon. Again after such an attack there seems to be an increased vulnerability to toxemia in the intestinal tract and fever returns easily or the temperature control may not have become stabilized and therefore is more easily disarranged.

It is impossible, early of course, to differentiate the typhoid and paratyphoid groups from the other toxemias, but time will determine even where blood cultures have been unsuccessful. Many cases of pneumonia will have very foul stools and direct attention to the bowel before characteristic lung symptoms have developed.

Pyelitis is very frequently overlooked by the general practitioner and by every one who does not make urinalysis a routine procedure. The history of any prolonged intestinal upset, or any infection of the upper respiratory tract, followed by fever, should demand a urinalysis. We must not forget that cystitis may also produce fever, increased frequency of urination and pyuria. Doubtless many so-called cases of pyelitis, diagnosed only by the presence of clumped pus cells in the urine, are really cases of cystitis. The blood count is disappointing in many cases and will show relatively a low leucocytosis, probably because the pus is being eliminated through the ureter and is not absorbed. When, however, the ureter is blocked at all, a high polymorphonuclear leucocytosis with chills and high fever will be noted. It is difficult at times in many children to ascertain if there is increased pain over the kidney, and if the ureter is blocked it is difficult to get evidence in the urine of the pyelitis. One can never rely upon one or even several urine examinations to exclude absolutely such infections. Of course, when the diagnosis has been made the subsequent somewhat bizarre course is easily understood. It is important to direct attention to the focus of infection in such cases. Whatever plan our treatment of the pyelitis may follow, we should certainly direct treatment also to the mucosa of the intestine in colon bacillus infection, and to the upper respiratory tract in those cases presenting pneumococci, strepto- or staphylococci.

Focal infections are naturally uppermost in our minds in these days. Those of the appendix, ovaries, prostate, etc., can be left out of our discussion. In children we must investigate the tonsils, ade-

noids, sinuses and parasinuses, middle ear and mastoid, and the teeth. There is perhaps more difference of opinion anent the tonsils than any of the others. The buried type of tonsil seems to be the greatest offender and the least obvious one. A definite history of tonsillitis is not always obtainable, but the tonsil is surely septic if the lymphatic glands which drain it are enlarged and easily palpable. The blood count in such cases is often illusory, and yet the temperature may fluctuate around 99° F. for months. Large fat tonsils are not so frequently to blame, as they seem to empty the crypts in swallowing. The sinuses were formerly supposed to develop in very late childhood, but we are finding sinus troubles in comparatively young children now. A rather characteristic syndrome has often solved this problem. There may be slight nasal discharge, visible only on nasal examination, with sudden flare-ups of fever. A sinus or crypt may be blocked, which causes pressure, absorption of the pus and the attending chilly sensations, fever, aching in the limbs and a high polymorphonuclear leucocytosis. When discharge of the pus occurs, all of these symptoms clear up for a longer or shorter period. The x-ray gives very little satisfaction in these cases unless the antra or the frontal sinuses or the mastoid are involved. Every pediatrician ought to educate at least one nose and throat man on these cases which are difficult of recognition under expert hands and which are often overlooked by otherwise good men.

Otitis media ought not to be missed by the average man, but is found post mortem very unexpectedly at times. But here again the lymphatics which drain the rhinopharynx and the eustachian tubes should put a man on his guard. Direct examination of the drum membrane does not always reveal the intensity or extent of the middle ear involvement. Otitis media purulenta does not always progress to a rapid issue and one must not be misled by the slow development. A number of days may pass before the rupture of the drum membrane discloses the focus causing the fever. The young child may not locate the painful points definitely and thus the practitioner is thrown off the scent. The x-ray is valuable at times in determining whether there has been any change in the cells of the mastoid. Much destruction of the mastoid may take place without sufficiently definite localizing symptoms to put us on our guard.

The teeth are often overlooked in young children because we feel that they will be lost early any way. But badly decayed teeth are factors in bad health in other perfectly obvious ways.

Malarial infection is rarely overlooked in the South, and perhaps is too often the scapegoat for inaccurate work. In nonmalarial districts we may slip up on the diagnosis because it is uncommon and because our mental picture is that of the adult case with chills, fever and sweats occurring with distinct regularity. This is not at all the type in young children. Sometimes we find it cropping out in children who have come from severely infected malaria regions, down South, even after several years. It frequently complicates fractures. Some of the authorities on malaria have expressed a doubt that it is ever completely eradicated after a genuine infection. Certainly with us, where malaria is almost completely wiped out, the plasmodium is often difficult of identification, sometimes only after persistent search over many slides. The relief following administration of quinin may be due to its specific action on the plasmodium, but it must not be forgotten that quinin both inhibits heat production and increases heat dissipation.

Tuberculosis naturally suggests itself often, even in the child at birth, but the tuberculous involvement is infrequent in the very young child and advent is rather slight until the approach of puberty. If the child *in utero* is infected, the course is of such rapid nature that death is not long delayed. Also, if the child contracts tuberculosis by contact with active cases in the household the progress is apt to be rapid. But if under these circumstances the child has sufficient immunity and the contact is not very close, it may have enough vitality to carry it along unless there has been some other intercurrent infection. Measles and whooping cough are particularly liable to light up a latent tuberculosis that

otherwise the child might have been able to handle. It is very important in suspected tuberculosis cases to get a very accurate history of exposures. Sometimes it is contracted from a relative and many times from servants in the house. Frequently visitors and the possibility of house infection itself are menaces. The tuberculous skin reaction is very helpful in diagnosis in that in the young child the infection must necessarily be of recent date. Sometimes the child is so overwhelmed as to be unable to form antibodies and the test may be negative in the face of the fatal involvement. The lung symptoms in such cases are quite masked and it is probable that only the x-ray will point a definite diagnosis. The mass infection involves numerous small lobules extending subsequently into the lymph glands and winding up in a blood stream infection. Meningitis is then the fatal involvement.

The bovine type of infection is far milder and may be seen in the bone and the lymph gland involvement. It is apt to run lower temperatures than the human infection.

Other relatively infrequent causes of fever may be briefly summarized. Inanition fever occurs in the new born, possibly a reaction to the bacteria swallowed so soon after birth or to dehydration.

Septic infections sometimes spread from the umbilicus, although the umbilicus may itself seem to be normal. This sepsis follows the umbilical veins with possible phlebitis, periphlebitis, peritonitis, pneumonia or general sepsis.

Hysteria occurs in older children. Syphilis, malignancy, anemia, ulcerative endocarditis, heat stroke, starvation, especially past typhoidal, alimentary fevers and dietary toxemia may be mentioned.

Without going into details there are other causes of fever, many of which are more or less obvious. It must be conceded that some children are of a neuropathic constitution and will develop fever with slight and sometimes no apparent cause. The exertion of normal play and excitement of the moving picture show and other diversions may cause a rise of temperature. Such cases require rest in bed and such adjusting of the daily routine as will tend to counteract this nervous tendency.

DISCUSSION

Dr. R. J. Estill, Lexington, Ky.—One lesson we are to learn from a subject of this kind is the importance of making careful and complete physical examinations. In most cases after careful repeated physical examination the cause for a prolonged temperature can be determined.

Dr. W. A. Mulherin, Augusta, Ga.—Holt and Howland tell us you will find a normal variation of temperature from 97.5 to 100.5 degrees in some perfectly healthy children. Abt gives the same variations and substantiates his observations by stating he has followed many cases from infancy to childhood and even up to adolescence where the temperatures were normally 97.5 to 100 degrees. Abt states also that if you insert the thermometer a varying distance into the bowel it will give a varying temperature, and very far insertion will give a higher temperature. Therefore it is barely possible that some of the cases we may have been considering have had no fever, only this normal variation in temperature.

Dr. Frank Neff, at the Hot Springs meeting of this Section, reported the examination of 158 children. In those who cried or became excited he noted a variation in temperature from 0.2 to 1 degree in 39 per cent. In those who did not cry, but were under nervous tension, he found a variation of .2 to 1 degree in 10 per cent of his cases. In malnourished children the variation was decidedly greater.

A leukocyte count in cases of obscure temperature is very helpful. Non-pyogenic infections like typhoid, paratyphoid, tuberculosis and influenza will give a low white count or a leukopenia, while a pyogenic infection like otitis media, pneumonia, pyelitis, scarlet fever, etc., will give a decided increase of white cells. The result in the leukocyte count therefore will oftentimes direct one's efforts in the right direction and when properly followed up will lead to a correct diagnosis. It is my belief that some of our cases with temperature not going above 100.5 degrees, who have had a thorough history, physical examination, laboratory tests, including von Pirquet's, and the intradermal tuberculin test, have nothing of a serious nature wrong with them. I have consoled myself with the thought and belief that the heat regulating mechanism in the baby and child is very easily disturbed, as shown by the occurrence of inanition fever and sudden elevation of temperature in the newly-born, and especially the premature, when too many hot water bottles have been applied, and therefore I feel that some cases with slight elevation of temperature are not of serious moment.

Dr. Barbour (closing).—It is rather unsatisfactory to tell the mother of the child whose daily temperature is 99.5 to 100 degrees that this is just natural for the child. I am referring to cases that run a persistent temperature month after month. There is surely something wrong. I hoped to get some help from you men of large experience.

FURTHER OBSERVATIONS UPON THE SHADOWS OF THE THYMUS AND THE HEART*†

By L. R. DEBUYS, M.D.,
and
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Two years ago one of us (DeBuys) read a paper before this Section upon the service of the newly-born which had been inaugurated at the Touro Infirmary, and among other things called attention to the fact that this service offered exceptional opportunities for the study of the infant not only at birth, but subsequently in the follow-up division of the service. Since this time several pieces of investigational work have been done, including our original study of the shadows in the thorax of the newly-born which was presented before the American Pediatric Society in May, 1922. The summary of this previous study was as follows:

(1) That the heart shadows vary as to shape, size and position.

(2) That these variations occur with no relation to the size of the infant.

(3) That the heart shadows may be grouped in several types according to shape.

(4) That variations in size and position occur in each of these types.

(5) That there is no constant relation between the heart shadow and the shadow of the thymus.

(6) That the shadow of the thymus is not necessarily influenced by the position of the heart.

(7) That the shadow of the thymus varies in its size and position independent of the heart shadow and with no relation to the size of the infant, and

(8) These variations in the shadows of the heart and of the thymus can exist without clinical manifestations of disease.

Since then it has been possible to follow these infants first studied and in none of them has any symptom attributable either to the heart or to the thymus been noted.

In the present investigation we have pursued our observations on the infants included in the first study, making radiographs at the ages of six months and one year, and besides we have continued our previous study of the newly-born. Only infants presenting no clinical manifestations of disease are included in this series. The same technic employed formerly has been continued, not only for purposes of comparison with the original studies, but also because we could find no other method practicable which offered any advantage over ours. It was as follows: the baby was placed in the recumbent position and a double intensifying screen carrying a duplitized film was used. The opening in the diaphragm (12 centimeters) of the tube carriage was centered over the cardiac area at a working distance of 26 inches, 110 milliamperes of current with a backup of three and one-half inches was used, and an exposure of one-tenth second made. The time factor was regulated by an automatic timer.

There were included in this study four hundred and fifty observations.

Because of the difficulty of preventing the infants from moving at the time of making the radiographs many of the plates had to be discarded from the study. Every radiograph was eliminated in which the observation made was not a true anteroposterior exposure. Any rotation therefore which would naturally affect the correct interpretation was excluded. The comparative observations at the different periods suggest the method employed to be sufficiently accurate.

In the continuation of our studies in the newly-born we have had no cause to alter our original conclusions either with

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*Read in Section on Pediatrics, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

†From the Newly-Born Service of the Touro Infirmary.

regard to the heart or to the thymus or to the relation of the two. In the comparative observations made at birth, the sixth month, and one year, some interesting information is obtained both with regard to the heart and the thymus.

The heart apparently does not rotate during the first year as the individual grows, but the shape remains the same as to type and position. There is, however, an increase in size in this organ, but the increase is not comparable to the increase in the size of the thorax. Hence the cause of the change in the position of the apex beat is due to the relatively greater increase in the size of the thoracic cage as compared to the increase in the size of the heart judging from the observations shown in this study.

The great blood vessels show a gradual lengthening between the upper border of the heart and the upper margin of the thorax with the increasing size of the thorax as the age of the individual advances. At the same time the shadow of the diaphragm does not reach as high; the heart, however, maintains its same relation to the diaphragm. These changes occur in the normal heart. While these observations are shown in all the radiographs, they are especially noticeable in Figs. IV, VII and XII.

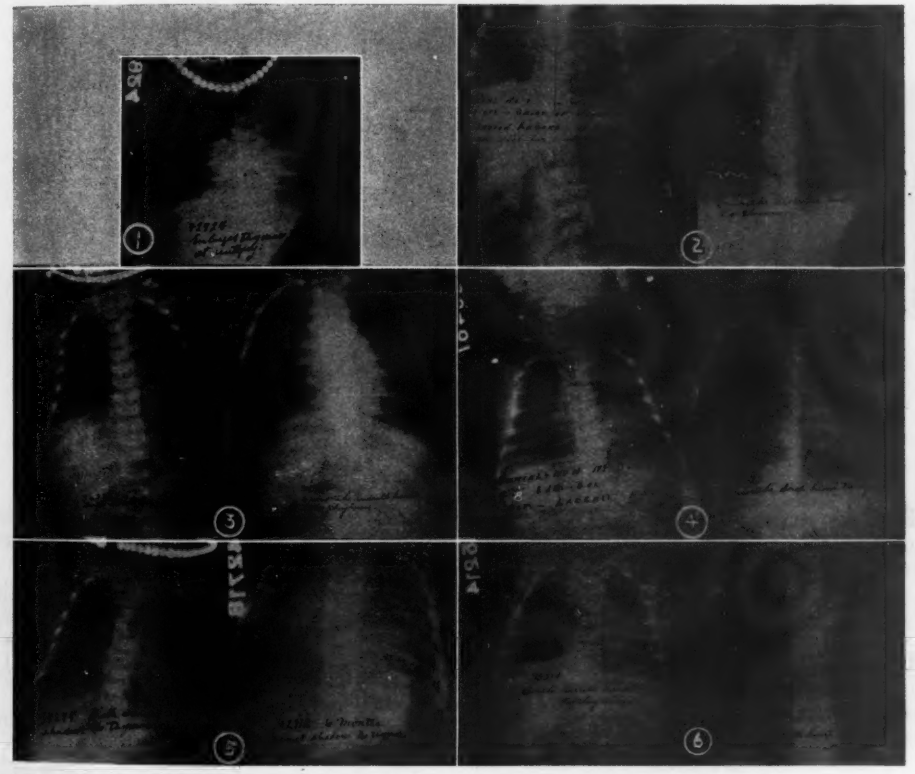

Fig. 1.—42924. Enlarged thymus confirmed at autopsy. Death on second day due to cerebral hemorrhage. Weight of thymus 18 grams.
Fig. 2.—31089 Birth. Globular heart. No thymus. 84747 Six months. Globular heart. No thymus.
Fig. 3.—36352 Birth. Adult heart. No thymus. 39808 Six months. Adult heart. No thymus.
Fig. 4.—30457 Birth. Drop heart. No thymus. 33417 Six months. Drop heart. No thymus.
Fig. 5.—39275 Birth. Unusual heart shadow. No thymus. 42718 Six months. Unusual heart shadow. No thymus.
Fig. 6.—35214 Birth. Adult heart. No thymus. 42939 One year. Adult heart. No thymus.

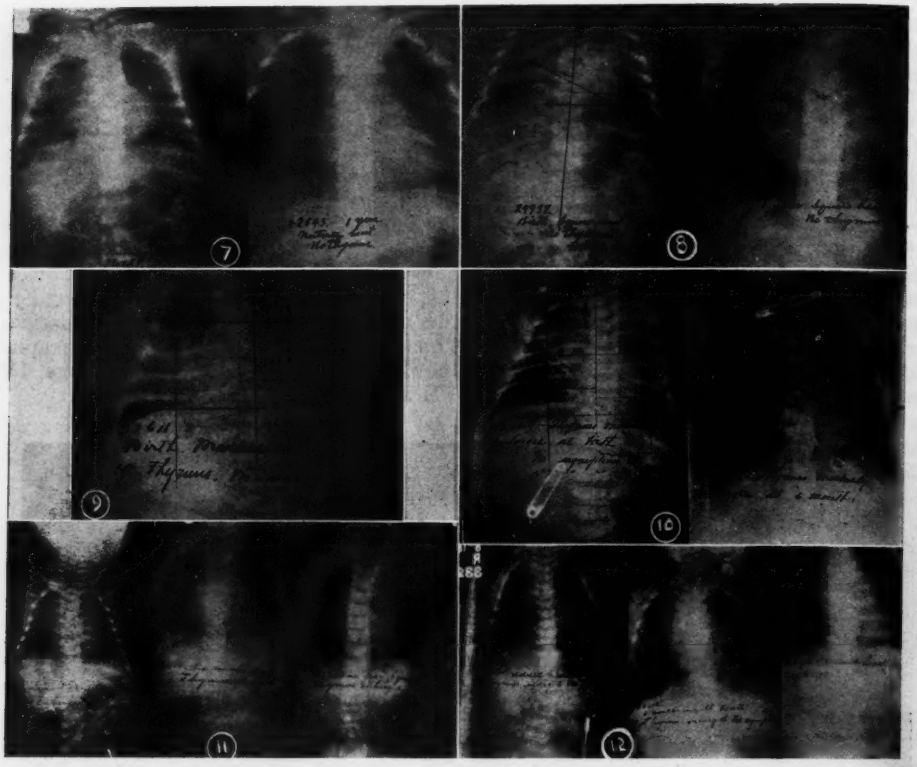

Fig. 7.—35009 Birth. Nutmeg heart. No thymus. 42543 One year. Nutmeg heart. No thymus.

Fig. 8.—29937 Birth. Square heart. No thymus. 36540 One year. Square heart. No thymus.

Fig. 9.—31611 Birth. Globular heart. Enlarged thymus. No symptoms.

Fig. 10.—32149 Birth. Adult heart. Thymus markedly enlarged. No symptoms. 35427 Six months. Adult heart. Thymus markedly enlarged. No symptoms.

Fig. 11.—32668 Birth. Square heart. Thymus enlarged. No symptoms. 36917 Six months. Square heart. Thymus enlarged. No symptoms. 42877 One year. Square heart. Thymus enlarged. No symptoms.

Fig. 12.—33287 Birth. Adult heart. Thymus enlarged. No symptoms. 36612 Six months. Adult heart. Thymus enlarged. No symptoms. 42938 One year. Adult heart. Thymus negative.

Fortunately, the mortality in the service has been extremely small. This has prevented very many autopsy confirmations of our radiographic examinations. Fig. I, however, clearly shows a typical shadow of the enlarged thymus, as we have been interpreting them, with a marked enlargement of the thymus to both the right and the left sides, more especially to the right side. This was confirmed at autopsy, there being practically the same appearance in the topography of the heart and the thymus, as was shown in the x-ray. The thymus in this case weighed 18 grams. While we have not had many opportunities to autopsy our studies, we do believe that our readings (radiographic) are properly based, as is shown in the above instance as well as in comparative observations at the different ages.

In the comparative study of the birth and six month shadows of the thymus, certain interesting observations have been made which are of especial interest, as, for example, we have found:

(1) A shadow of a thymus at birth with a shadow at six months (Fig. X).

(2) A shadow of a thymus at birth with none at six months (Fig. XIII).

(3) No shadow of a thymus at birth with none at six months (Fig. II).

(4) No shadow of a thymus at birth with a shadow at six months (Fig. XV).

These same variations have been noted in the observations made at birth and one year.

Further interesting observations have been noted in the birth, six months, and one year shadows, as for example:

(1) A shadow at birth, a shadow at six months, a shadow at one year (Fig. XI).

(2) A shadow at birth, a shadow at six months, no shadow at one year (Fig. XII).

(3) No shadow at birth, a shadow at six months, a shadow at one year (Fig. XV).

(4) No shadow at birth, no shadow at six months, no shadow at one year (Fig. XVII).

It is seen, then, that all kinds of variations in the shadow of the thymus may be noted without the gland causing any clinical manifestations of disease.

SUMMARY

(1) Our original observations are further confirmed with regard to both the heart and the thymus.

(2) The technic employed seems to be entirely satisfactory, as is shown by the comparative observations at the different ages.

(3) The change in the position of the apex beat of the heart in the first year is apparently not due to its rotation, but to the slower growth in size of the heart as compared with the more rapid growth in the size of the thorax.

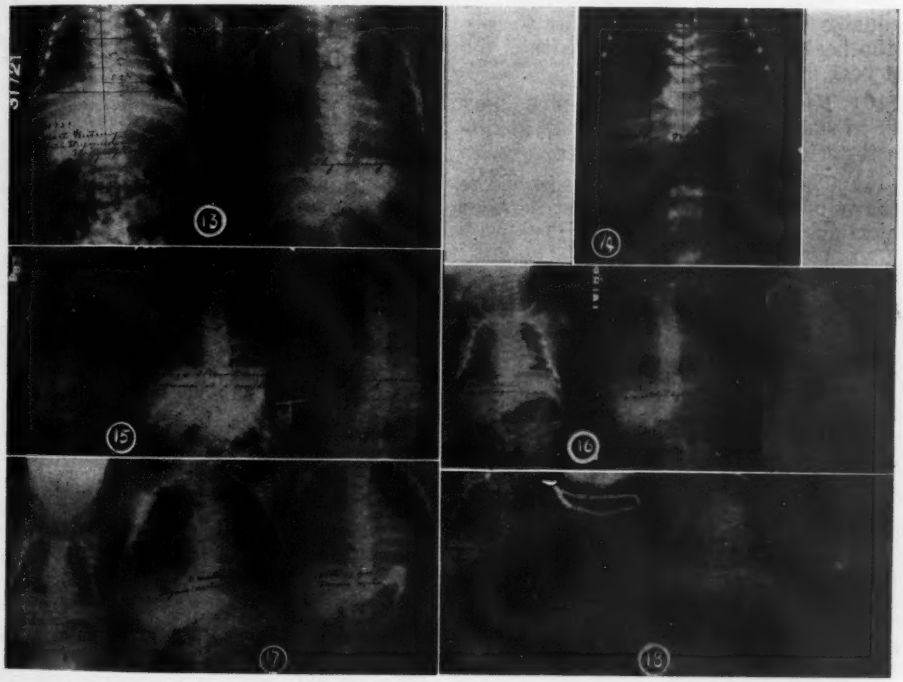

Fig. 13.—31721 Birth. Nutmeg heart. Thymus enlarged. No symptoms. 35162 Six months. Nutmeg heart. Thymus negative.

Fig. 14.—32602 Birth. Nutmeg heart. Thymus negative.

Fig. 15.—29643 Birth. Adult heart. Thymus negative. 33422 Six months. Adult heart. Thymus markedly increased. No symptoms. 36449 One year. Adult heart. Thymus still enlarged. No symptoms.

Fig. 16.—34405 Birth. Globular heart. Thymus negative. 38197 Six months. Globular heart. Thymus negative. 43054 One year. Globular heart. Thymus negative.

Fig. 17.—36024 Birth. Adult heart. Thymus negative. 39625 Six months. Adult heart. Thymus negative. 42746 One year. Adult heart. Thymus negative.

Fig. 18.—37249 Birth shadow abnormal. No classification. No symptoms. 37299 Next day. Heart shadow abnormal, smaller. No symptoms. 37899 One month. Adult heart. Markedly enlarged Thymus enlarged. No symptoms. 38830 Three months. Adult heart. Moderately enlarged. Thymus enlarged. No symptoms.

(4) The great blood vessels in the mediastinum show a decided lengthening during the period of the first year.

(5) The heart shadow remains the same as to type and position during the first year, but there is an increase in its size.

(6) The various types of heart shadows previously described persist throughout the first year without clinical manifestations of disease during this period.

(7) The growth of the size of the heart is not influenced by the size or position of the thymus.

(8) There is no relation between the increase in the size of the shadow of the thymus with the increase in the size of the shadow of the heart.

(9) The shadow of the thymus does not gradually increase or decrease uniformly in the healthy infant, at least within the first year of life.

(10) The shadow of the thymus may vary in size in the same individual at different periods within the first year.

(11) These variations in the size of the shadows of the thymus may exist without clinical evidence of disease.

DISCUSSION

Dr. William Weston, Columbia, S. C.—It would be instructive if Dr. DeBuys will give what he considers the more important clinical manifestations of enlarged thymus. It is claimed that about 33 per cent of all infants at birth have so-called enlarged thymus, but I do not believe that it can be successfully proved that nearly so large a number manifest clinical symptoms referable to this organ. We are inclined to suspect an enlarged thymus when convulsions occur in the young associated with dyspnea and cyanosis or where breath holding spells occur in association with dyspnea or cyanosis.

The roentgen ray is a valuable aid in making a diagnosis and is equally valuable as a therapeutic agent.

Dr. W. A. Mulherin, Augusta, Ga.—I would like to ask Dr. DeBuys if he took into consideration in his observations the cycle of respiration. I think Gerstenberger has brought out the point that the thymus gland is larger at the end of inspiration than at the end of expiration. I think also the observations will help to explain why we find the left border of the heart a centimeter beyond the left nipple line at birth and about six or seven years of age the left border lies upon the nipple line. Heretofore I think it has been believed that the high situation of the diaphragm pushes the heart outward.

I would like to ask Dr. DeBuys' opinion on a case. Shortly before leaving home I saw a child nine months of age, breast fed, who had been nursed a little too long. Cow's milk was advised. The child took the cow's milk and had the most beautiful picture of anaphylaxis and vasomotor symptoms with blood showing in the stools. The child was tested out by cow's milk protein cutaneously and the test showed the very highest reaction. The child also showed enlargement of the thymus. We intend to put that child on x-ray treatment on Douglas Symmer's theory that enlarged thymus is an expression of anaphylaxis. I should like to ask Dr. DeBuys what he would do in a similar case.

Dr. DeBuys (closing).—In our paper we were considering only shadows in the normal individual, not in those with clinical manifestations of disease.

Whether the thymus is enlarged or not, should there be any symptoms of the disease, as for example cyanosis, sinking spells, dyspnea or convulsions, which cannot be accounted for in any other way, the thymus should be treated and should be treated immediately whether it is much enlarged or not. Usually, however, we have found that if the thymus is at fault it is enlarged. It may be enlarged in varying degrees.

When we made our first observations we considered the question of accuracy in making our radiograms. Many methods were considered as to how to get the shadow of the thymus in the same cycle not only in relation to respiration, but to circulation as well.

Another method was considered to secure a true antero-posterior picture, namely, by placing in the median line anteriorly and in the median line posteriorly metal tapes so that when the shadows of the tapes fell one upon the other the position was supposed to be correct. With our method, however, all radiograms that were not true antero-posterior were discarded.

In our series we have noticed shadows not of the heart and not of the thymus, but possibly evidence of glandular enlargements which were found in the same relative position with regard to the heart and thymus at the different periods studied, these shadows maintaining the same relative positions throughout the series. With these shadows as landmarks we have become more convinced of the accuracy of our observations.

In connection with the case that Dr. Mulherin referred to, a child may go to varying periods in its life without showing any clinical manifestations of disturbed thymic function. These disturbances may begin at almost any time. It is reasonable to suspect that in the particular instance he relates the toxic condition that the child experienced may have influenced the thymus in producing the same symptoms as though they were due primarily to the thymus itself, in which event the thymus should be treated immediately.

The question was asked as to the weight of the thymus at birth. There are various measurements given. It is generally believed that about 7.7 grams is the average.

TROPICAL DISEASES AND PUBLIC HEALTH

THE VALUE AND USES OF COMPLETE AND ACCURATE VITAL STATISTICS*

By W. A. PLECKER, M.D.,
State Registrar,
Richmond, Va.

I have been selected by the Conference of Southern State Vital Statisticians to read a paper for this meeting of the Public Health Section of the Southern Medical Association, setting forth the purpose and aims of our organization.

Most if not all of our number are, or have been members of the Vital Statistics Section of the American Public Health Association and value most highly the deliberations and fellowship at those meetings.

The Southern members of that Section of the American Public Health Association have, however, long realized that while we have nearly all of the problems that confront the rest of the country, we have some that are strictly our own, due especially to the large colored population, the characteristics of the white people of our section, and the sparseness of the white population in many localities.

The registrars of the Southern states agreed that it would be helpful if they could get together once a year and discuss in an informal manner their troubles, comparing notes as to their successes, and devising the most satisfactory methods of overcoming their difficulties.

The first conference was held at Atlanta about two years ago and proved of so much value that it was decided to continue the meetings annually. In considering the place of meeting some of us, especially those living in border states, who are accustomed to attend regularly the meetings of the American Public Health Association, favored holding the conferences in conjunction with it.

It was found, however, that a number desired to attend the Southern Medical Association, which met at about the same time. Two years ago the meetings were on exactly the same date. Even when the dates are not the same it was not practical for all to attend two meetings closely following one another and so far from home. The majority favored meeting with the Southern Medical Association and the rest of us yielded.

There are other reasons also for our preference, chief of which is that if we can attend but one of the meetings we prefer to be with those with whom we are working and whose problems are the same as ours.

In meeting at the same time and place with you rather than entirely independently as we did at our first meeting, we are doing it partly in the interest of economy. We are influenced more, however, by the belief that in rubbing elbows with the leading members of the Southern medical profession and meeting you face to face we can secure inspiration from you and at the same time show you in various ways that we conduct a great arm of public health work with which you should become well acquainted, and which you should learn to use in many ways in private and public health work.

The evidence of successful vital statistics work is admission to the Registration Area of the U. S. Bureau of the Census, based upon success in securing the registration of 90 per cent or more of the deaths and births occurring in the state.

This is determined by elaborate and painstaking tests made by representatives of the Bureau of the Census in the office of the state bureau being tested, comparing the certificates for a certain period with lists of births and deaths secured in advance from postmasters, mail carriers, ministers and other classes of people living in the local communities.

To reach the point of securing reports of 90 per cent of the births and deaths of a Southern state is not an easy task. It is made more difficult as the proportion of the colored population increases.

To attain this result presupposes that the people of the state have been made familiar with the requirements of the vital statistics law and that they are in active sympathy with it.

*Read in Section on Public Health, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

They must be shown not only that it is the law, but must be convinced that the law will be enforced. This is not always an easy matter unless the local officials are in sympathy and will perform their duty in an impartial and fearless manner.

The people must likewise be shown that this registration is of value to them or their families, few being greatly interested in its value to the state alone.

In reaching the general public the first and most essential problem is to bring the members of the medical profession to realize:

(1) the value of vital statistics to the state and the individual;

(2) that the reporting of births and deaths is a requirement of the law with penalties for its non-observance;

(3) their individual responsibility in making reports of their own work and of impressing upon their clientele that this is a valuable provision of the state law and that it should be carefully and promptly obeyed.

The large mass of ignorant, dirty and untrained midwives of our Southern states must likewise be brought to know that the reporting of a birth to their local registrars is an essential part of their duties, and that their failure to do so makes them liable to the law.

Above all else must they be taught how either to make the report themselves or to secure the assistance of some one who has sufficient education to do it properly.

Deaths are to be reported by the undertaker or by the head of the family when there is no undertaker, the certificate being first presented to the attending physician for his statement as to the cause of death.

This feature of the law which seemed to the originators of the "model law" simple and easy to enforce, owing to the fact that undertakers are required to file a complete certificate and secure a burial permit, doubtless works smoothly and nicely in the populous Northern states with customs different from those of the South.

With us, however, in the rural sections many burials occur without an undertaker, friends digging the grave and covering the remains.

The coffin is made by a local carpenter or is purchased from a country store, and no undertaker figures in the transaction.

Another difficulty also peculiar to the more sparsely settled South is that we cannot as a rule simply appoint as local registrar the town clerk or other official for his town and surrounding country, extending but a comparatively short distance around. In many sections, particularly in the mountains, towns are far apart, and it becomes a problem to locate registrars convenient to the people and yet not so close together as to interfere with one another.

The problems of our Southern state registrar must, therefore, for some time to come be of an elementary though fundamental character.

We must establish and maintain a list of local registrars, properly located, capable and interested, and must teach them how properly to perform their own duties and to show others.

While we strive thus to fit our local registrars, we must not desert them and leave them to rely upon their own usually insufficient resources, but must establish and maintain a constant propaganda of instruction to physicians, midwives, undertakers, coffin dealers and the general public.

We must see that the penalties of the law are enforced when we discover physician, midwife, undertaker or other person who by neglect or positive opposition disregards the law.

These essential tasks must be accomplished and we must secure a steady and fairly complete inflow of certificates before we can attain a place on the Registration Area and be in position to be greatly interested in the refinements and nice scientific points of vital statistics.

These are the things that hold the attention of the leading statisticians of the American Public Health Association, most of whom are free from the drudgery of the Southern state registrar, and have ample time, means and facilities for considering the real science of vital statistics.

While some of our men are developing their office so as to be able to engage in this interesting phase of the work, we must for some time to come continue the grind of securing as nearly as possible 100 per cent registration and of getting the

certificates in our office promptly and as completely and accurately as possible.

Each of our Southern state registrars is interested not only in getting his own state up to a high standard, but also in seeing his brother registrars swing their states into line.

The experience of the two previous meetings shows that these conferences in which our difficulties, our failures and our successes are discussed in a frank and an informal manner, are of great help to all of us.

We are meeting with this Section of the Southern Medical Association not with the expectation or the desire of being set off into a separate section.

We do hope, however, to quicken your appreciation of the value of vital statistics in your work and to lead you to call upon us freely for such information as may be helpful to you.

We hope also by our association to lead you to realize our entire dependence upon the medical profession to furnish us the data upon which our statistical compilations are based.

We would impress upon every physician that the fundamentals of writing an acceptable birth certificate are:

(1) to do it legibly, using unfading black ink;

(2) to do it accurately in every detail, especially in the writing of names, places and dates;

(3) to do it promptly, within ten days;

(4) and to deliver the certificate to the correct local registrar.

In reporting deaths, the chief object is to secure an accurate statement from the physician as to the cause. In this connection I would say that it is well worth the time of any physician to acquaint himself with the correct terms and phraseology of making this report, thus relieving the state office of the necessity of writing hundreds or even thousands of letters monthly to secure more accurate and complete statements.

The doctors should also scan the other statements of the certificate and see that the undertaker gives the names and other information accurately.

With the names incorrectly written, doctors frequently certify to the death of persons entirely different from those they have attended. In the collection of insurance claims, pensions and war indemnities this is a matter of primary importance.

When transcripts of these certificates are to be used in foreign countries errors of this character cause incalculable trouble. In years to come these statements will mean everything to those making genealogical studies.

If all doctors, when they sit down to write a certificate, will keep in their minds the importance of promptness and accuracy, it will take no more of their time and add immensely to the value of our work and to our ease in doing it.

In affiliating with you we hope to arouse your full interest and sympathy in our difficult but fundamental branch of health work, and at the same time perhaps to bring before you from time to time suggestive thoughts, ammunition that may be used on the firing line by public health officials.

If acceptable, our little group of statisticians stands ready to present to each meeting of your Section, as well as to the Section on Obstetrics, papers bearing upon the scientific question with which we deal.

Beside the individual use made of birth and death certificates for many purposes, a wide-awake health officer can use the records of his vital statistics office as the very foundation upon which his health work is built.

How can a health officer who is struggling to reduce his tuberculosis, typhoid, diphtheria or infant diarrhea death rate know the progress that he is making without prompt and careful study of the history of these diseases in the past? Accurate birth and death statistics of today will be just as interesting to the sanitarian of one hundred years hence as to the worker on the firing line at this time. The spirit of our office which we constantly keep before us, in our effort to secure accurate and complete registration, is that we are doing this work for those who will come after us five hundred years hence.

The prompt report of births is essential for the use of the health officer and visiting nurses who are endeavoring to do effective child and maternal welfare work and for the basis upon which he calculates

his infant death rate, or the number of deaths under one year of age per 1000 births.

Poor birth registration gives him a high infant death rate and makes a bad showing for his office.

The Virginia Bureau of Vital Statistics furnishes promptly each month to the other bureaus of the Health Department cards suitable for filing alphabetically, upon each of which is the record of a death from tuberculosis, typhoid fever, diphtheria, infant diarrhea and dysentery and malaria. Upon each card is given the name of deceased, place, date, color and age, with the name and address of the attending physician. These are compiled by the bureaus interested, by localities, and the information is used in studying conditions and tracing contacts.

The tuberculosis bureau in particular has made excellent use of these lists for locating and examining exposed individuals during a period of several years after the death. In this way they have promptly located new cases.

Other methods of utilizing this valuable information will suggest themselves to any zealous health officer.

Our office has found that newspapers are eager for fresh vital statistics, especially when the latest year is compared with those of the past and progress in health work is shown.

As soon as possible after compiling the statistics for the previous year, a series of letters are sent out to all of the papers of the state, weekly or as near so as possible, in which one subject such as births, marriages, divorces, illegitimate births, etc., is covered in each letter. Then the deaths from various causes are similarly discussed, conclusions are drawn, and suggestions as to their prevention are given out. Many large daily papers give these letters front page space with catchy head lines, while the county papers use them quite freely also, often making editorial comments.

Local papers are always eager for such information dealing with their own city or county, and any health officer who has access to the statistics, if at all gifted in writing for newspapers, can secure the finest sort of publicity. Newspapers will not accept straight letters of advice nearly so readily as when they are in the form of a discussion of vital statistics adroitly leading up to the advice.

DISCUSSION

Dr. F. M. Register, Raleigh, N. C.—As Dr. Plecker says, we in the South are interested in getting the certificates. Later, when they are coming easily, we can make studies and comparisons.

Dr. Roy K. Flannagan, Richmond, Va.—This paper pertains also to the division of obstetrics. Dr. Dempsey was commissioned by the vital statisticians to give his paper to the division of obstetrics. You know Dr. Leathers in his address stated that it is necessary in medical education in all of its divisions that emphasis be laid on the preventive side. This public health group of doctors should see to it that before each division of medicine in this Association there be brought at each meeting at least one paper on the preventive side of that particular division. Certainly the preventive idea in obstetrics, in surgery, and in other phases of medicine should be emphasized. Since the vital statisticians have brought this idea to us, let us carry it to the other divisions which are separate from us. We come here year after year and talk to public health officers on public health. This body ought not to be isolated from the regular medical profession, but should carry its message directly to the groups who perhaps need its instruction more than we.

Dr. George M. Kober, Washington, D. C.—May I point out the value of vital statistics for comparative purposes? Last year I was engaged in the study of tuberculosis in colored people and the Indians. I found, much to my gratification, that Charleston, S. C., had kept accurate records of tuberculosis in colored people and the whites since 1822. The statistics show that from that year until the Civil War the mortality rates from this disease were practically the same in both races. In the decade from 1865 to 1874 we note an enormous difference. The white rate was less than 200; the colored rate was over 400. In 1875 to 1884 the white rate remained about the same, while the colored rate rose to over 600, and these marked differences were maintained up to 1900. In 1910 the colored rate had declined to 332.8 and in 1920 to 262. These observations led me to conclude that the colored race is not peculiarly susceptible to tuberculosis while enjoying the benefits of proper food and housing conditions, and that their high mortality for several decades after the Civil War was due to unfavorable environments such as lack of proper food, low standards of living, etc.

Dr. Plecker (closing).—Some twenty years ago I was called upon to prepare a paper on tuberculosis in a symposium and wanted some statistics on the death rate. I found that these statistics in Charleston, S. C., were the only ones available at all on the colored rate.

We have in our possession in our office in Virginia some extremely valuable statistics dating back to 1853, under an old law by which the commissioners of revenue gathered the statistics. I have been delving into them a little and hope to be able to get enough money to put in a clerk to get some information out of them.

276

SURGERY

RAILWAY, INDUSTRIAL, GYNECOLOGICAL, OBSTETRICAL AND UROLOGICAL

STERILITY: A STUDY BASED ON A SERIES OF 526 PATIENTS*†

By GUY L. HUNNER, M.D.,
and
LAWRENCE R. WHARTON, M.D.,
Baltimore, Md.

This paper is based upon observations made on a series of five hundred and twenty-six private patients treated for sterility between 1904 and January, 1922. Practically all of these patients were treated by Dr. Hunner.

THE CAUSES OF STERILITY

The Husband.—The condition of the husband was ascertained in 279 out of 526 cases (52 per cent). Of these 279 husbands, 56 (20 per cent) were found to be sterile. By far the commonest cause of sterility was azoospermia, and this condition was usually associated with evidence of gonorrheal infection. Congenital lesions were not encountered in this group of cases.

German observers before the War (Kehrer, 1892; Lier and Ascher, Sanger, 1899; quoted by Kelly in "Medical Gynecology") reported male sterility in from 40 to 50 per cent of their cases, and found the male either diseased or sterile in from 50 to 70 per cent. These are much higher figures than we have ever found in the American literature. It is probable that an examination of all the husbands would have resulted in a higher percentage of sterile men, for those who have reason to think themselves unfertile are prone to balk at an investigation.

The Female.—In all these patients sterility was the outstanding complaint, and in most instances was the only reason that led them to seek professional advice. Most of these women were in excellent health. All but fifty of them were less than thirty-six years of age.

THE CAUSES OF STERILITY IN 526 WOMEN

In some cases it is a simple matter to determine the cause of sterility. More often the problem is difficult and complex. There is, for example, a great difference of opinion at the present time concerning the importance of cervical discharges, cervical stenosis, small fibroids and retrodisplacements in preventing conception. We shall enumerate briefly all the pathological lesions found in our cases and attempt to determine their importance by the results we have obtained.

In summary, about one-third of our patients had noticeable cervical discharges; one-seventh had an acid cervical leucorrhea; one-sixth had pelvic infections; one-seventh had retrodisplacements; one-tenth had cervical stenosis; one-eleventh had amenorrhea in varying degrees; one in twelve had developmental abnormalities; one in twenty painful coitus; and one in twenty uterine fibroids. In one-twelfth of our patients we could find absolutely no cause for the sterility.

THE TREATMENT OF STERILITY

Of these 526 patients, 363 were treated by us for their sterility. For various reasons 163 patients are eliminated in the consideration of results. Of these, 56 were not treated because their husbands were not fertile. In 13 patients, no treatment was instituted because no abnormalities were found. In 9 instances, lesions were found which demanded radical surgery: tuberculous salpingitis, 2; gonorrheal pyosalpinx, 5; myomata, 1; and carcinoma of the cervix, 1. A large number of patients came merely for consultation. An equally large number were not sufficiently eager to have children to undergo the inconvenience of the indicated treatment. In consider-

*From the Gynecological Department of the Johns Hopkins Hospital.

†Read in Section on Surgery, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

ing the results that we have obtained, we have, therefore, eliminated these cases.

RESULTS

Taken as a whole, of the 363 women who accepted our treatment 91, or 25 per cent, conceived. There have been in all 110 pregnancies among these patients, which resulted in 81 full-term babies, 15 miscarriages and 4 extra-uterine gestations. In 10 instances we do not know how the pregnancies terminated. One patient had twins.

Disturbances in Menstruation.—Of the 91 patients who became pregnant, 53 had normal menstrual histories, the remainder presenting various irregularities. These figures indicate that, although a normal menstrual history is a favorable prognostic sign, dysmenorrhea and other irregularities are not insurmountable obstacles.

In our experience the most unfavorable type of patient in this regard is the one with persistent amenorrhea. Only 4 of our 49 patients with amenorrhea have become pregnant. One of these patients conceived after six years. She did not menstruate more frequently than once or twice a year, and on one occasion did not menstruate for six years. Two other patients menstruated every two or four months. One of these conceived after five years. The fourth patient, who had been sterile for thirteen years, had menstruated every six months before her marriage, but since then every six weeks. Three of these women bore normal children, and the fourth had a miscarriage. Barton C. Hirst has reported similar experiences. It is thus evident that even patients with marked amenorrhea may bear children and should not be pronounced hopelessly sterile.

As this record shows, the treatment of sterility apparently due to endocrinopathy has been disappointing. Patients with sterility of this type have been uniformly referred by us to competent internists for complete study, and the treatment instituted has been based upon their findings. We have not administered glandular therapy in treating sterility except in the presence of definite disorders of the endocrine system and we cannot condemn too heartily the use of glandular extracts unless they are indicated. The indiscriminate and wholesale exhibition of extracts of the thyroid, ovary, pituitary, thymus and mammary glands in all cases of sterility, regardless of other factors involved, befogs the situation, is irrational and unscientific, and when followed by an occasional pregnancy, one questions whether the happy result has been influenced by the shotgun therapy.

Dietary Factors in Sterility.—The significance of a properly balanced diet in its relation to sterility has been impressed upon us by the notable experimental contributions of McCollum, Reynolds and others. It is a routine procedure with us in every gynecological patient, regardless of the complaint, to take a fairly complete medical history and to perform a thorough physical examination. If it becomes evident that metabolic factors are concerned and that there are signs of malnutrition, we obtain medical consultation and treat the patient accordingly. In our experience it is exceptional to find private patients who subsist on a diet so deficient that sterility could result and we have as yet seen no definite instance in which sterility has been overcome by merely regulating the diet. This is, however, one of the many phases of sterility that should always be borne in mind, and it undoubtedly demands more intensive clinical and experimental investigation and application.

Cervical Stenosis.—Brilliant results are occasionally encountered in this group of cases. Cervical stenosis was diagnosed and treated by us 55 times, and 18, or almost one-third, of these patients became pregnant. One of these patients had a fibroid tumor and another, a retrodisplacement of the uterus, neither of which was disturbed.

In 9 of these 18 patients our only treatment was the passage of the uterine sound with the usual antiseptic precaution of painting the cervix with iodin. In 3 patients Hegar dilators were also introduced. In 3 instances stem pessaries were used. Curettage was performed upon only 1 of these 18 patients. Taken as a whole, the average period of sterility of this group of 18 patients was two and a half years; and the average period

elapsing between treatment and conception was four months.

Cervical stenosis is without doubt a much overrated diagnosis, and has, therefore, fallen into considerable disrepute. The above facts, however, would indicate that such a condition does exist and is a definite factor in causing sterility.

The indiscriminate use of the curette cannot be too strongly condemned. In many patients thus treated we have found multiple organic strictures along the cervical canal instead of the one point of mechanical angulation or narrowing which the patient may have had at the internal os before curettage, and which could have been overcome by the simple office treatment with the uterine sound or Hegar dilator.

Dyspareunia.—In 5 per cent of our cases, dyspareunia has apparently been a factor causing sterility. In 15 of our cases the dyspareunia was uncomplicated. In ten instances other pathological conditions were present.

In order to obtain an accurate estimate of the significance of uncomplicated dyspareunia, we shall consider these cases separately. In 15 such cases we have had 6 patients (40 per cent) who conceived after periods of sterility as follows: ten years, four years, three and a half years, three years, ten months and six months, respectively. Four of these patients became pregnant within one month or less, and 2 after longer periods. In the treatment of these patients, dilatations of the hymen and vagina, tampons and douches were the only procedures used. In 10 cases associated lesions complicated the picture. In these 10 cases we have had 2 pregnancies, 20 per cent.

Retroversions and Displacements.—Seventy-six (14 per cent) of our patients had retrodisplacement of the uterus. Sixty-four had been sterile for over two years. The fact that one-third of these patients had previously conceived and had since been sterile, immediately suggests that in a large number of them the sterility was due to puerperal infections.

In only 23 of these 76 cases was the retrodisplacement uncomplicated. (In 1922 Palmer Findley pointed out that sterility may be the only symptom in uncomplicated retrodisplacement.) In 23 instances the uterus was bound by adhesions, indicating an old inflammatory process. This was the most serious and almost the most frequent complication that we encountered.

Among other complications noted in these cases of retrodisplacement were cervical infections and discharges, 24 cases (31 per cent), some of which were definitely gonorrheal; amenorrhea, 4 cases; myomata uteri, 3 cases; adenomyoma, 1 case; and carcinoma in a lacerated cervix, 1 case.

Our treatment of these cases varied. In 19 patients we were able to correct the malposition and insert the appropriate type of pessary without any anesthetic. Five of these patients became pregnant, one having twins. Thirteen patients were subjected to a suspension operation. Three of these became pregnant, thus making a total of 8 pregnancies in 32 patients in whom the uterus was put back into normal position. That an uncomplicated retrodisplacement in itself may be no bar to conception is demonstrated by the fact that 4 such patients became pregnant after dilatation of the cervix without replacement of the uterus into normal position. In such cases it is possible that the retroflexion causes a cervical obstruction which results in sterility.

In summary, of 57 patients with retroversion whom we treated for sterility, 14, almost 25 per cent, conceived. It is instructive that not a single pregnancy occurred in the group of patients with adherent retrodisplacements, indicating that the displacement itself was not the chief cause of sterility, but rather the inflammatory lesion involving the Fallopian tubes. In such patients, one may find little or no evidence of disease on pelvic examination, and the history may be equally inconclusive. The futility of local applications and cervical treatments in this group of cases is demonstrated by this record. In these patients we must examine the Fallopian tubes, and for this purpose we find the transuterine inflation of

the tubes by means of gas an invaluable aid.

Tubal Infections.—Eighty-two (16 per cent) of our patients had tubal infections. Of these, 2 were tuberculous; 2 were of appendiceal origin; and the remainder were puerperal or gonorrheal. In 24 of these 82 women, the infection and sterility had followed a former miscarriage or confinement; and 58 of these patients had never been pregnant. In many cases the tubal infections were associated with cervicitis and retrodisplacement of the uterus.

Results in Pelvic Inflammatory Disease. We have performed conservative operations upon 12 of these 82 patients. In 4 instances it was necessary to remove one tube; in 8 cases salpingostomies were done for hydrosalpinx; and in 3, tubal adhesions were released.

Three of these 12 patients became pregnant after such operations upon the tubes. These 3 patients had been sterile for seven, five and a half and five years, respectively, and became normally pregnant in three years, two and a half years and three months after operation.

Thirty-six patients received from us non-operative treatment of various sorts, being unwilling to submit to laparotomy. In this group we have not had a single normal pregnancy.

It seems, therefore, that in patients with long standing sterility due to infections of the Fallopian tubes, medical therapy, cervical and intra-uterine applications are almost surely effort wasted. Time will tell us the true value of the Rubin test in those cases in which we succeed in opening the closed tubes by means of carbon dioxid gas under high pressure. In our experience, conservative surgery has given us our best results. In the future, we hope to improve our results by utilizing and improving the methods recently devised.

Myoma.—Twenty-seven patients (5 per cent) had fibroids. In only 4 of these 27 patients were additional complications present which were sufficient in themselves to produce sterility: azoospermia twice and salpingitis twice. In 23 patients, therefore, the sterility was possibly due to fibroids of the uterus.

This group of patients is striking because of two particulars: their age and their long period of sterility. The average age of these patients was thirty-three and a half years; the average period of sterility was eight and a half years. Abnormal uterine bleeding was present in only 3 of these cases. Menorrhagia is, therefore, not the usual cause of sterility in patients with fibroids. In 10 patients, the menses were perfectly normal. Twelve complained of dysmenorrhea. Some of these fibroids were not more than four or five centimeters in diameter, while others were large enough to fill the true pelvis.

Of these 27 patients, 5 received no treatment from us. In 10 patients, for various reasons, the myomata were not removed, the patients receiving only cervical treatments, curettage, cauterization or dilatation of the cervix, as the situation indicated. In this group, we have had only 1 normal pregnancy.

Myomectomies were done upon 11 patients. Six of these operations were performed by us, and 3 of these 6 patients later had normal children, after having been sterile for seven, five and four years, respectively. Five patients had had myomectomy performed before they came to us, and in 3 of these 5 patients tumors had reformed. One of these 5 patients became pregnant after we dilated the cervix. Thus, of 11 patients 4 became normally pregnant after myomectomy. The only obstetrical complication in this group occurred in 1 patient who required cesarean section because of recurrent fibroids.

It thus seems that in patients with myoma of the uterus, even though there be no menstrual disorders, the chance of pregnancy is distinctly enhanced by myomectomy. Moreover, myomectomy also removes a cause of serious dystocia should conception ensue.

Artificial Insemination.—We have had only 2 patients upon whom we performed artificial insemination. One of the patients thus treated conceived after having been sterile for two years. She later conceived again naturally.

Endocervicitis. — Two hundred and thirty (43 per cent) out of 526 patients who complained of sterility had cervical

discharges. We shall base our conclusions upon 157 cases, eliminating 73 either because of sterility of the husband, because the patient received no treatment from us, or because she had been sterile for less than two years. There remain, therefore, 157 patients with cervical discharges who had been sterile for at least two years, who received treatment from us, and whose husbands were sound. In 33 per cent the discharges were acid. Of these 157 women 26 per cent had previously conceived.

For the sake of clearness we shall divide these cases into two groups: first, the cases of uncomplicated endocervicitis; and second, cervicitis plus complications.

Uncomplicated Cervicitis and Sterility. In 73 patients we were able to find no cause for the sterility except endocervicitis, and these patients received no treatment except for the cervical discharge. We operated upon only 3 of these patients. Two were subjected to trachelorrhaphy and 1 to amputation of the cervix. None of these 3 patients conceived. Twenty-one patients were treated by local applications of iodin, silver nitrate or carbolic acid, tampons and douches being employed when indicated. Five of these 21 conceived. Forty-nine patients received only cauterization of the cervix in radial strokes after the manner described by Hunner. Thirteen of these 49 patients (26 per cent) became pregnant. In none of these 73 patients were sounds or any intra-uterine instruments employed.

Thus, of 73 patients with cervical discharge who had been sterile for at least two years and who were treated only for their cervical infections and discharges, 18 (24.6 per cent) became pregnant. This indicates that cervical discharges are a definite factor in preventing conception and are to be reckoned with in the treatment of sterility.

Cervicitis plus Complications.—Eighty-three patients with cervical discharges had other conditions also and received additional treatment.

Of these 83 patients, 20 (24 per cent) conceived. In these cases it is impossible to tell whether the sterility was due to the cervical condition or to the complication.

The Use of the Cautery in Sterility and Endocervicitis.—In our experience radial cauterization is more effective than any non-operative procedure in overcoming endocervicitis, and in the child-bearing age should always be tried before any radical cervical operations are recommended. It should, however, be performed with care and be followed up by proper after-treatment in order to avoid cervical stenosis and scar.

The Transuterine Inflation of the Fallopian Tubes.—Until recently we have had no sure means of determining the patency of the Fallopian tubes. This is, of course, a question of fundamental importance, for a woman is hopelessly sterile as long as the tubes are closed. Heretofore, lacking any special method of investigating the tubes, we have assumed that they were normal unless the palpatory findings or history indicated that they were diseased. According to the test recently devised by Rubin, this assumption does not seem to be warranted, for we are finding that the tubes are closed in many instances where we have no reason to suspect the presence of adnexal disease. Before the Rubin test evolved, we felt that the tubes were closed in about 16 per cent of our cases of sterility, and this impression was based upon the clinical evidence of salpingitis. Using the Rubin test, however, numerous observers (Peterson, Cron, Aldridge, Ward, Rubin and others) have found impervious tubes in from 30 to 45 per cent of their cases and our experience confirms these unexpected findings.

During the past fifteen months we have used the Rubin test on 35 patients; but since we have used it only in selected cases and not as a routine procedure, our statistics should not be used as an exact indication of the incidence of tubal obstruction in sterility. In 9 patients, the gas passed in freely before the pressure reached 100 mm. Hg. In 12 cases we were unable to force any gas through at all, even at pressures as high as 200 mm. Hg. In 14 instances we diagnosed partial occlusion, the pressure rising to 140 mm. or higher before the gas passed through.

The diagnostic value of a procedure like the Rubin test depends upon the accuracy with which it reveals the condition

of the organs under investigation. Fortunately, in 4 cases we have been able to check up our findings by operation. In these instances palpatory findings were negative, but the Rubin test showed the tubes to be completely closed. At operation in 2 of these cases the fimbriae were found completely sealed over; in 2 the tubes looked perfectly normal, the fimbriae were open, but the interstitial portions of the tubes presented the characteristic picture of chronic salpingitis. It is our impression, therefore, that the Rubin test is accurate, so far as the detection of complete obstruction is concerned.

Very frequently, however, the tubes seem to be only partly obstructed, the gas passing through the tubes at levels distinctly above normal. What is the correct interpretation of this reaction?

This question cannot yet be answered finally because no one has yet made an extensive pathological study of the tubes in such cases. As a consequence, there are quite a number of cases in which we cannot tell whether the tubes are actually concerned in causing the sterility or not, and this is one of the shortcomings of the Rubin test as it is performed at the present time. In many of these cases we doubt whether there is any intrinsic disease in the tubes, for with the abdomen open we have found that a very slight kink in a normal tube will produce a definite obstruction to the passage of gas. Aldridge and Ward, moreover, have found that in association with retroflexion of the uterus, the tubes occasionally become occluded and that when the retrodisplacement is corrected, the tubal obstruction disappears. The congestion of menstruation will also cause temporary closure of the tubes. In other words, wo do not feel that a partial obstruction as determined by the Rubin test always represents a pathological condition. It may be due to a temporary mechanical alteration in a normal tube.

In performing salpingostomy, it is essential to determine the patency of every segment of the tube and this cannot be done with certainty by inspection, probing or palpation. This is particularly true when one is investigating the uterine portion of the tube. Before the introduction of the Rubin test the question of patency in this part of the tube had to "be guessed at from its general appearance" (Graves). This guesswork can be absolutely eliminated if with the pelvic organs well exposed one distends the tube with gas either through the cervix (Rubin test) or through the fimbriated extremity. By this simple procedure one can determine the exact location of any obstruction, and after salpingostomy has been performed, one can likewise determine whether the lumen has been restored.

The Therapeutic Value of the Rubin Test.—Of what value is the Rubin test as a therapeutic procedure? In other words, after closed tubes have been opened by means of gas, how frequently does pregnancy occur? We have had 10 patients with closed tubes in whom we have been able to force gas through by raising the pressure to 200 mm. Hg., and in these 10 women there has followed only 1 pregnancy. In this instance, after having been sterile for thirteen years, the patient developed a tubal pregnancy five months after the Rubin test had been performed.

In our hands, therefore, the Rubin test has not yet demonstrated any definite therapeutic value, but it seems to be a step in the right direction. This is the opinion at present of Ward and Aldridge of New York, who, after having insufflated 600 cases, do not feel sure that the Rubin test can be credited with any of the pregnancies that have occurred in these patients. It is too early yet to pass final judgment on this question. Despite certain limitations, we have found it to be an invaluable aid in diagnosis, and hope that, as time goes on, we may learn how to apply it usefully in the treatment of sterility.

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DISCUSSION

Dr. M. Y. Dabney, Birmingham, Ala.—A stumbling block in any attempt to treat sterility is that the woman will submit to almost any kind of an examination in order to become fertile, but the male does not usually wish an examination of any sort. I am as a rule loth to advise laparotomy for sterility because the woman always says, "Can you assure me that I will become pregnant if I have an operation?" and I have to tell her that I cannot. Cervical discharges have been the feature in most of the cases in which I have achieved results. However, the individual may have a tear, a weeping uterus with a mouth that looks like an alligator, and yet have a child once a year. The fact that there are discharges does not mean that she is not fertile.

Probably chronic pelvic inflammatory disease is a factor in more cases than we realize, all of which calls to mind that we should practice very conservative surgery. Many post-operative cases become sterile.

We should go carefully into the history of the woman. With the woman who comes in for a general surgical operation, where we think considerable work will have to be done in the pelvis and the individual has a history of having had abortions performed many times, we can be radical. Otherwise we should be very conservative in any work we do inside the pelvis. In old infections associated with leucorrhea, when the tubes are removed it is well to remove the intramural portion of the tube, unless the individual says, "Do not do anything you can help, to make me sterile."

Dilatation and curettage, particularly the curettage, often do considerable harm. I believe the most common custom is to say to the patient who complains of sterility, "I will curette you." By this we run the risk of getting an inflammation in the tubes, and if we resect and get scar tissue around the tubes this will help to produce sterility.

Diet has been shown by many workers to be a factor of importance in fertility. Every effort must be bent to improve the general physical condition of the two patients, the man and woman, under consideration.

Dr. E. H. Richardson, Baltimore, Md.—In every case of conception there are three essentials: first, normal spermatozoa; second, a normal ovum; and third, a patent canal from the external os to the fimbriated end of the tube so that fertilization may take place. Therefore, if 20 per cent of the sterile marriages, as reported in this paper, are due to impotency of the husband, the practical point is that in every case of sterility there should first be made a microscopic examination of the husband's semen, not merely a physical examination of any sort. Having determined that point, the next thing is to determine as far as possible the question of the normal ovum. This must be determined upon the menstrual history of the patient and examination of the ovaries. The third point is the determination of the patency of the canal by Rubin's method of transuterine inflation, which is invaluable for this purpose. When you consider that in these 600 cases of sterility from various causes, most of them treated prior to the introduction of Rubin's method of examination, the sterility has been overcome in such a large percentage, you realize that the report is most encouraging. The probability is that most of the cases in which Dr. Wharton and Dr. Hunner could not determine the cause, had closed tubes. Of the ones that were treated three conditions covered practically 90 per cent of the etiology, namely: disease of the cervix, endocervicitis and stenosis; disease of the Fallopian tubes; and malposition of the uterus, complicated and uncomplicated. The extent of the cervical disease and its eradication Dr. Wharton has gone into. The correction of faulty position of the uterus he also discussed, and the determination of patency of the tubes in that group in which you cannot discover anything by palpation is now a simple matter by means of the Rubin test.

Dr. Mary Freeman, Perrine, Fla.—A lady came into my office recently and said that she had been married for eleven years. She was then 26 years old, but looked about 18. On examination I found a very small uterus and a small cervix. She was anxious for children and I treated her with mixed glands. I saw nothing more of her for six months and at that time she was three months pregnant. All through that pregnancy there was a general disturbance. Her body did not seem to be able to carry the thing through properly, but at term, in January, 1919, she was delivered of a fine male child, ten and a half pounds. She made a good recovery and the child developed splendidly. At nine months he looked like a child of eighteen months and weighed 32 pounds. A few weeks later he developed a cold and following this some two or three weeks later a bowel trouble, from which he died. At first I was delighted over the result of the treatment, but in the outcome I was not, and I do not know whether I did the right thing or not.

Dr. S. L. Jeffrey, Miami, Fla.—A lady, aged 32 years, came in my office last winter who had

been married twice, the second time for two years, and who had never been pregnant. The menstrual history was normal. Five or six years before coming in she had a pyosalpinx on the left side and the tube was removed. She was referred to me with an endometritis and salpingitis. Following curettage I applied the gas test and found the remaining tube closed. I used the gas three times, on the third application possibly with a little more pressure than I had applied previously, and I could hear the gas go through the tube. She was unwilling to undergo any further treatment at that time. She was discharged, but the symptoms had cleared up, although she had rather a stormy convalescence which I think was due to the salpingitis. A few weeks ago I received a letter from this patient stating that she had become pregnant and her doctor had assured her that the pregnancy was normal in every respect.

Dr. Guy L. Hunner, Baltimore, Md.—I think that Dr. Wharton's work in getting these cases together in such a systematic manner is a matter for which we should be thankful. I am extremely thankful to him, for while I knew I had a good deal of material lying in my case histories if it had not been for Dr. Wharton I fear it never would have been brought out. His analysis shows the advantage of being systematic in the treatment of these cases. I was impressed as a hospital interne and resident by seeing these patients come through the clinic with a history of the "shotgun therapy" to which most of them had been subjected, and made up my mind that we should be more systematic in our treatment to determine which therapeutic measure caused the desired effect.

Dr. Dabney very rightly warned us of the danger of curettage in these cases. Why curette? Why not leave this mucosa which is usually normal? Many patients have a stenosis which is much worse after the curettage, the raw surface coming together and causing more stenosis than before.

By careful analysis of the case we try to arrive at the most likely cause of the sterility, and if treatment aimed at this condition is not successful in a few months we take up the second most likely cause and apply the remedies suited to it. The patient is sometimes overanxious for results and seeks a more radical physician, but if we explain the plan to the patient and tell her that it may take a year or more to relieve a sterility of from two to ten years' duration, she is usually willing to give intelligent and patient cooperation.

We have a great deal of work to do on the endocrine question, on the dietary factors, and on the cases that will require chemical and pathological study in diagnosis and treatment.

Dr. Wharton (closing).—It was easy for me to write the paper. The clinical material, however, represents many years of careful work by Dr. Hunner.

Dr. Dabney brought out the point that conservative surgery should be done during the child-bearing age and that harm may result from the indiscriminate use of the curette, opinions with which we agree. The indication for radical surgery should not be based upon a factor as variable as the patients' wishes, for women at times change their minds.

Dr. Richardson emphasized the necessity of examining the husband. Although we found only 20 per cent of the husbands to be sterile, I should say after going over our histories that the husband was responsible in fully 50 per cent of the cases. When, to the cases of azoospermia and decreased fertility in the male, conditions which are largely due to gonorrhea, you add the numbers of cases of salpingitis and cervicitis that are contracted from the male, then you get a fair estimate of the part played by the husband in producing sterility.

The Rubin test has made it possible to tell whether there is a passage for the ovum. We do not know very much, however, about the physiology of the tube and its capability of regeneration after infection. On the basis of what we do know, it seems fair to state that patency of the tube is not the only condition essential for conception. If it were, there should be a larger number of pregnancies in women whose tubes have been opened up by operative procedures and by the Rubin test. There seem to be other factors equally important. We know that infection changes the character of the tubal epithelium. The mucosa of a hydrosalpinx is not like the mucosa of a normal tube. There may also be changes in the secretions of a diseased tube as there are in the cervix, and these pathological secretions may be incompatible with the life of the ovum or the spermatozoa. These are factors over which at present we have little control, and which may play a determining role in sterility.

Dr. Freeman mentioned glandular therapy. We did not discuss this extensively in the paper because we had not time. Our results have not been very good. We have never been afraid of "whipping up" the function of the reproductive glands too much by endocrine therapy. On the contrary, we have not been able to "whip them up" sufficiently with the preparations on the market. We feel that this is a problem not yet solved.

Dr. Jeffrey brought up the question of pregnancy following infection. We have always been interested in this question. Several years ago in the *Archives of Surgery* I published an article on "Pelvic Abscess," reporting 625 cases. Of these, 91 per cent were apparently gonorrheal, 2 per cent tuberculous, and 7 per cent puerperal. All of these patients were treated conservatively by vaginal incision and drainage without removing any structures. There were no subsequent pregnancies in patients who had tuberculous pelvic abscess. Sixty per cent of the patients with puerperal pelvic abscess later became pregnant, and 10 per cent of those in whom the pelvic abscess had been due to gonorrhea. It is worthy of note that 40 per cent of all these pregnancies resulted in miscarriage and that the incidence of puerperal infections in these subsequent pregnancies was high.

These records seem to show that pelvic infections are not always followed by sterility, and that patients who become pregnant after having recovered from a pelvic infection are particularly liable to miscarry and develop acute exacerbations of the old inflammatory process during the puerperium.

INDICATIONS FOR NEPHRECTOMY IN NON-MALIGNANT DISEASES OF THE KIDNEY*

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A better knowledge of kidney pathology brought about by recent improvements in urological technic and laboratory methods has more clearly defined the indications for nephrectomy and brought the operation into the group of safe operative procedures. In rapid succession the leaded catheter, the dye test, and the opaque media for pyelography have taken their places in the diagnostic armamentarium of the urologist. These go hand in hand with improvements in cystoscopic instruments and methods which make it possible to treat effectively many diseases that would eventually destroy the kidney.

In determining the status of a diseased kidney we must know the type of disease present, the amount of healthy tissue left and the effect of the disease on the opposite kidney. It is necessary also to know whether or not the other kidney is diseased and its functional capacity.

Probably the best method of studying the indications for nephrectomy in non-malignant diseases is to analyze our operations of this kind done at St. Elizabeth's Hospital, Richmond, Va. There have been twenty-nine nephrectomies done at St. Elizabeth's Hospital since it was opened in 1912. Sixteen of these cases have been previously reported by Dr. J. Shelton Horsley ("A Study of a Consecutive Series of Nephrectomies," *Va. Med. Monthly*, July, 1921). There was only one death, which followed bronchopneumonia in a man seventy years old. The remaining twenty-eight cases made satisfactory operative recoveries. The following non-malignant diseases are represented in our series: nephrolithiasis, pyonephrosis, tuberculosis, hydronephrosis, cortical abscess, cysts of the kidney, hematuria and acute pyelonephritis. The condition most frequently necessitating nephrectomy in our series was stone in the kidney. There were eleven cases, three of which had had stones removed from the same kidney previously. In seven there was an accompanying pyonephrosis. In the remaining four an accompanying pyelonephritis had destroyed the function of the kidney. There were only two cases of pyonephrosis without stone, one caused by a kink in the ureter producing obstruction, and the other the result of a neglected stone in the ureter. There was one operation for cysts of the kidney. The patient had previously been operated upon and the cysts punctured. When the kidney was removed it was found to be principally a mass of scar tissue with a few small cysts. One nephrectomy was done for cortical abscess. There were no symptoms referable to the kidney and the urine was negative. The condition was discovered during an operation for gall bladder disease.

There were four nephrectomies for hydronephrosis. One of these was done to relieve the patient of intense suffering and shock. The cause was probably a kink in the ureter. The operation was done in 1913, before the cystoscope was so generally used for treatment. It is probable that such a case, if seen now, could be relieved without operation. In one case the function of the kidney was completely destroyed by an obstructing kink at the uretero-pelvic junction. The other two cases of hydronephrosis were due to stricture of the ureter resulting from the passage of stones.

One patient came with constant bleeding from one kidney. He had lost weight and his hemoglobin and red cell count were below normal. No cause could be found for the bleeding. An operation was done and the kidney bisected down to the pelvis. No lesion could be demonstrated. Following this operation the bleeding

*Read in Section on Urology, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

cleared up completely, but secondary hemorrhage fifteen days later necessitated a nephrectomy. One kidney was removed because of acute pyelonephritis following stone in the ureter.

Five nephrectomies were done for tuberculous infection. In every case the disease was believed to be unilateral, and the improvement in the health of these patients has borne out this conclusion.

Nephrectomy is always indicated in tuberculosis of the kidney regardless of the stage of the disease or the function of the diseased organ, provided the other kidney is free from infection. In cases in which one kidney is far advanced in disease and causing septic symptoms, and the other kidney mildly infected with good function, the patient will enjoy improvement in health and longer life if the more diseased organ is removed.

As a general rule, multiple stones in the kidney or recurrent stones require nephrectomy. A more conservative course may be taken if the kidney has good function and there is very little infection present. Pyonephrosis is a very obstinate condition to treat and whether accompanied by stone or not, if the disease is unilateral, nephrectomy should usually be done.

Hydronephrosis, if seen before the function of the kidney has been destroyed, can frequently be relieved by conservative means. If due to twists or kinks of the ureter, adhesions can be broken up and the kidney anchored at a higher level, giving better drainage. Obstructing stones may be removed and strictures dilated by a bougie passed through the cystoscope. Plastic operations on the pelvis of the kidney have not been successful, and if the pelvis is so much enlarged that it prevents proper drainage, a nephrectomy is indicated.

Polycystic kidney is a bilateral condition and nephrectomy is only advisable when secondary disease such as stone or infection endangers the life of the patient. Simple cysts of the kidney are associated with interstitial nephritis and are not often bilateral. If the kidney is functioning, it should not be removed.

Cortical abscesses always demand nephrectomy. There is too much danger of infection and secondary hemorrhage if an attempt is made to resect the diseased portion of the kidney. If nephrectomy cannot be done because of poor function in the opposite kidney, the abscess should be punctured and drained.

Surgical treatment should be a means of last resort in idiopathic or essential hematuria. Stripping the capsule and bisection have been tried with rather doubtful results. Should the bleeding be sufficient to endanger the health of the patient, nephrectomy is the operation of choice.

In every case that we have had an opportunity to follow, there has been improvement in the function of the sound kidney following the removal of a markedly diseased one. This is not altogether due to work hypertrophy, for often these diseased kidneys have been functionless for months. An extra burden of toxic material is removed from the sound kidney as well as the danger of becoming secondarily infected.

Regardless of the pathologic condition existing, surgical judgment must be largely influenced by the functional capacity of the supposedly normal kidney. This is obtained by the differential function test. Phenolsulphonephthalein is usually used. One cubic centimeter of the solution is given intravenously and specimens collected separately from catheters in each ureter. The specimens are collected in bottles containing a few drops of alkali so that when the dye appears in the urine the specimen turns red. In a normal kidney it should appear in from five to seven minutes, and in the first twenty minutes about 1 per cent a minute should be eliminated. Frequently when one kidney has been functionless for a long time, its fellow will eliminate as much as 30 per cent of the dye in twenty minutes. When one or both kidneys cannot be catheterized, or when it does not seem advisable to do so, indigocarmin is useful as a rough indicator of the kidney's function. It is given intravenously, and its appearance from the ureters observed through the cystoscope. It appears in about the same time as phenolsulphonephthalein, and a kidney is considered practically functionless if there is no appearance of the dye in twenty minutes.

A severe pyelitis or stone in the kidney pelvis or ureter will often cause a marked diminution of function without noticeable destruction of the kidney parenchyma. The normal function will be resumed in these cases following the removal of the irritating factor. There are other cases in which the symptoms have existed for a number of years and in which the pyelogram shows the kidney pelvis to be markedly dilated with the calyces practically effaced. In such cases there is very little hope for improvement in function and nephrectomy is the quickest means of relief for the patient.

The following cases illustrate types in which the surgeon must be guided by the pathology that he finds at operation:

Mr. L. A. V. was admitted to St. Elizabeth's Hospital May 6, 1922, complaining of colicky pain in the left side of the abdomen radiating to the back. The symptoms had existed for one week. Urinalysis showed a large amount of albumin, hyalin casts and leucocytes. On cystoscopic examination the bladder mucosa was hyperemic in the region of the left ureteral orifice. The right ureter was catheterized without difficulty. The catheter met obstruction about half-way up the left ureter. Phenolsulphonephthalein appeared from the right kidney in four minutes, and 15 per cent was collected in twenty minutes. There was no appearance from the left side in twenty minutes. X-ray of the kidney and ureter was negative for stone. Pictures taken following the injection of sodium bromid showed the ureter to be normal in appearance and the kidney pelvis incompletely filled. The kidney shadow was about twice normal size. At operation a very large congested kidney with a tense capsule was found. Exploration of the pelvis and palpation of the upper ureter was negative. The capsule was stripped back and the wound closed. The patient's symptoms were immediately relieved and at examination two weeks later dye appeared from the left kidney in eight minutes, and 9 per cent was collected in twenty minutes. The function of the right kidney was the same as before operation. The obstruction was still present in the ureter, but the patient refused further treatment. When heard from recently he was in good health.

Mr. D. L. J. entered St. Elizabeth's Hospital October 23, 1922, complaining of pain in the mid-epigastrium at intervals for the preceding five years. A few days before entering the Hospital he had a severe attack of pain in the right lower quadrant of the abdomen radiating into the bladder. There were a few red blood cells and a considerable number of leucocytes in the urine. The total phenolsulphonephthalein output was 25 per cent. X-ray showed a small shadow in the region of the lower end of the right ureter. On cystoscopic examination the bladder mucosa was hyperemic. Both ureteral orifices appeared normal. There was so much spasm of the right orifice that the ureter could not be catheterized. Indigo-carmin given intravenously appeared from the left kidney in four minutes. There was no appearance from the right kidney in twenty minutes. The condition was believed to be stone in the right ureter with temporary suppression of urine in the left kidney. At operation a very small stone was found lodged in a stricture of the ureter about three inches above the bladder. Above this point the ureter was very much dilated and filled with pus. The kidney was removed. The pelvis was very much infected and presented several small ulcers on its surface. There was one small cortical abscess. This patient made a satisfactory recovery.

DISCUSSION

Dr. Edgar G. Ballenger, Atlanta, Ga.—We should be able to find out before operating by a proper study of pyelograms as well as from the other studies of the genito-urinary tract whether a diseased kidney is benign or malignant. To leave a kidney in place when you are almost sure to have a recurrent stone is bad surgery. The nearly exact manner in which we can determine the functional capacity of the kidney that we are taking out makes us proud of urology as a specialty.

Dr. Guy L. Hunner, Baltimore, Md.—In the past we have all been looking at these kidney problems as if they were purely kidney problems and we have been overlooking the fact that many of them are really problems of drainage. The kidney pathology is often secondary to an obstruction in the lower ureter. I would like to take that up with reference to just three of the different classifications of kidney pathology that occurred in Dr. Dodson's paper. In the first place I will take the stone in the kidney cases. We are now finding that almost all of our kidney stone cases have ureteral stricture. If that is true we have to look at it from the standpoint of drainage, and before operating on the kidney stone, prepare our patients by giving them good ureteral drainage.

Dr. Dodson spoke particularly of stones recurring in the kidney after operation. If the patient has already had a nephro-lithotomy the kidney had better be removed, unless it shows a good quantity of good kidney material. If we obtain good drainage before we operate the first time we do not so frequently get recurring stone. What is also of importance is the fact that most ureteral strictures are bilateral, and even if they do not primarily show stones in both sides, many cases of recurring stone have the second stone on the other side. That is evidence that there is stasis on both sides. In patients who are rather advanced in years, you will find that if you establish good drainage the patient has no more pain. The pain has not been due to stone in the kidney, but to stasis in the ureter and pelvis. They fatten up and get rid of their gastro-intestinal symptoms and to all intents and purposes become well after treatment of the stricture. They may have to come back occa-

sionally for dilatation, but that is far preferable to operating and having recurrent stone in the kidney.

Second, consider the question of hydronephrosis. These cases are at least 90 per cent primarily ureteral stricture cases, and in most instances again the problem is not one of attacking the kidney but of draining. A patient with a pelvis on one side holding 100 mils of urine and showing in the pyelo-ureterogram an immensely dilated pelvis, frequently has also a stricture on the other side. This may have a hydronephrosis of not more than 15 mils, and yet the 'phthalein test may show that the big kidney is doing the best work. We have had several cases of that sort. I remember one doing 25 per cent on the side of the large hydronephrosis and 10 per cent on the side that had not had symptoms, where we found stricture and a hydronephrosis of 15 mils. To have taken out the kidney doing 25 per cent of the work and to have left the one doing 10 per cent would have been poor surgery. Another patient had a hydronephrosis of 125 mils on the right side and 18 mils on the left, a 'phthalein output that could not be read on the right side, but 12 per cent total 'phthalein. I dilated the strictures on both sides. I found from the x-ray picture that she had adhesions at the upper end of the right ureter from repeated pyelitis attacks, and that we would have to operate upon that kidney and do a resection of the pelvis, but I did not wish to operate until I found her possibilities of recovery after she had good drainage. Within twelve weeks the right side was putting out 5 per cent 'phthalein, and the one on the left 31 per cent. I operated upon the right side, resected the pelvis, and did a fixation of the kidney. Three months later the patient had an output of 14 per cent on the right side, having had only 12 per cent for both sides when she came, and had 32 per cent on the left side due purely to the improved ureteral drainage.

Now, third, with the idiopathic hematuria cases, as Dr. Dodson said, no matter what you do you will find a tendency to recurrence. Almost all of these are bilateral stricture cases and all you have to do for them is to give good drainage. They have damage to the kidney substance from stasis. With no further treatment than passing some form of dilator and giving good drainage, in a good percentage you stop bleeding completely, and in all of them I have had improvement. They come back in six months or a year with bleeding again and you simply have to dilate them again. I wish to make this appeal, that we see whether many of these kidney problems are not really ureteral problems and problems of drainage.

Dr. Chas. H. McCollum, Fort Worth, Tex.—I believe some of the so-called idiopathic hemorrhages are early symptoms of a fibrosis.

Extreme care is necessary in the study of the ureter and the pelvis of the kidney. For five or six years I have been using simple air injection instead of the different preparations of silver. At present, I prefer it to the use of a bromid or the iodid of soda except that it does not bring out the calices so well as the bromid of soda. I consider air as an injection in the study of the ureter far superior to anything I have ever used. It is almost painless and if used properly is, I believe, without danger. It is done successfully in the office and the patient can be sent home without fear of further reaction.

Dr. R. Arthur Hooe, Washington, D. C.—Dr. W. J. Mayo claims that recurrent stone is not nearly so common as the fact that when lithotomy is done a stone or fragment is overlooked. At the Mayo Clinic the patient is routinely fluoroscoped on the operating table to search for calculi which may have been missed.

Dr. J. Shelton Horsley, Richmond, Va.—To determine the indications for nephrectomy requires very competent team work. I am incompetent to do a cystoscopic examination and I feel that a man who has a reasonably large general surgical practice has not the time, even if he has the ability, to make himself entirely competent in urology unless he confines himself to a very limited field in surgery.

Dr. Dodson (closing).—Dr. Ballenger's statement that each case must be considered and studied individually needs to be emphasized. Some people stand cystoscopic manipulations very poorly. Sometimes the patient is a working man who lives at a distance and has not the means or disposition to follow out a long routine of treatment with uncertain outcome in the hope of clearing up kidney infection or improving and bringing back a kidney that is very much damaged. If the other kidney is good in such a case the patient will be returned to his normal health and happiness much more quickly by a nephrectomy. Of course no kidney should be removed unless there is a good kidney on the other side. Sometimes the kidney that appears to have the most pathology, as Dr. Hagner brought out, has the best function. Some time ago we saw a patient with a big staghorn calculus on one side. The function in that kidney was 25 per cent in fifteen minutes. On the other side there was no stone, but there was an infection and a function of 5 per cent. We felt that if we tried to remove the big staghorn calculus the damage would outweigh the benefit.

Three of our patients have returned with recurrence of stone. Some of these stones may have been left or small fragments may have been left, as Dr. Hooe mentioned. Very frequently the thing left is infection and improper drainage, and if these cases are followed up by dilation of the ureter and pelvic lavage, there will be fewer recurrences.

I have never used the instrument for controlling pressure in the pelvis of the kidney when doing a pyelography. I fill the pelvis under the fluoroscope, generally by gravity, and have had no trouble.

It is preferable that every urologist be capable of doing not only urological operations, but any operation, because complications requiring general surgical judgment and technic often arise during and following genito-urinary operations.

HEMORRHAGES OF THE LATER MONTHS OF PREGNANCY*

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No emergency except, perhaps, that of eclampsia causes more apprehension in the mind of the patient and in the minds of the members of her family, and arrests the cerebration of the attending physician than does a hemorrhage in the later months of pregnancy.

These bleedings of the later months and during labor result from placenta previa and ablatio placentae. Although more attention has been given to the former, our experience shows that ablatio has a higher incidence.

In placenta previa, the bleeding occurs as a painless, causeless hemorrhage, at any time, from the sixth month to term. This is the first symptom and suggests the presumptive diagnosis which can readily be confirmed by vaginal examination. Vaginal touch reveals the circulatory changes which, owing to the low placental implantation, necessarily take place in the lower uterine segment, for a placenta is not considered as previa unless it is developed in the lower uterine segment and encroaches upon the dilating cervix. The physical signs which make the diagnosis in placenta previa are:

(1) Edema and a boggy feel of the cervix and lower segment. The cervix is unduly enlarged.

(2) The pulsation of the uterine arteries. This is very apparent on exploration of the fornices.

(3) The presence of a cushiony mass between the vaginal finger and the presenting part, and finally, the stringy feel of the edge of the placenta when the finger is passed through the os.

While these physical signs are present in all cases of partial and total placenta previa, the attendant should be warned that the diagnosis may be assumed on the occurrence of a painless, causeless bleeding, and that the diagnosis should not be confirmed by vaginal exploration until the vulva is properly prepared and sterilized, his hands are scrubbed and gloved, and he has at hand packing gauze, speculum and forceps, or is prepared to do an immediate bipolar version in case his examination causes alarming bleeding. Sometimes the gentlest manipulation, even through the rectum, may start up a torrential hemorrhage.

Once the diagnosis is made, terminate the pregnancy. In doing this, there are three basic principles which must be followed: (1) conserve blood loss; (2) avoid sepsis; and (3) minimize the trauma. The first hemorrhage is a danger sign, and while the woman seldom dies from the first hemorrhage, she may succumb from the second. Furthermore, repeated or continued bleeding reduces her individual resistance to operative trauma and infection. Once the diagnosis is made, certain factors determine our plan of procedure.

(1) The period of pregnancy. One will readily appreciate that the same plan of procedure need not be employed on a nonviable fetus that would be elected in the interest of a living child. Hence (A) before viability, in all cases, our aim should be to control bleeding and secure dilatation of the cervix. This may be done with a firm, vaginal pack. As soon as dilatation of the cervix is obtained the pack is withdrawn and bipolar version is performed. The breech controls the hemorrhage by acting as a tampon. But the subsequent delivery of the child should be spontaneous, effected solely by uterine contractions. No traction should be made by the accoucheur, for the friability of the lower segment in placenta previa predisposes to uterine rupture, with its

*Read in Section on Obstetrics, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

hemorrhage, shock, sepsis and embolism. (B) After viability the factors controlling our method of delivery are:

(1) The degree of cervical dilatation.
(2) The amount of hemorrhage.
(3) The presence or absence of sepsis.
(4) The type of previa.
(5) The condition of the child.
(6) The condition of the mother.

Fortunately, the majority of placenta previae occur in multiparous women, and many of the marginal cases in which bleeding occurs at the beginning of labor may be treated and the hemorrhage controlled by simple puncture of the membranes, thus allowing the presenting part to crowd into the pelvis and lower uterine segment and close the bleeding sinuses by compression.

If no dilatation has occurred, and the patient is not in active labor, a firm, aseptic, moist vaginal pack will stimulate uterine contractions, control the hemorrhage, and dilate the cervix, and upon its removal any bleeding can be controlled by puncture of the membranes or podalic version, which brings the conical breech into the lower segment to act as a tampon.

In the more extensive partial and central types, the condition of the child, the amount of blood loss, the condition of the patient and the presence or absence of sepsis will determine the election of the hydrostatic bag, or of cesarean section. The former may be used within the membranes, after their rupture, to compress the placenta against the open uterine sinuses, or as an extra ovular bag in which case, when it is distended, it will separate the placenta and membranes for an equal distance on all sides, allowing the lower segment to retract, thus closing the bleeding sinuses by direct compression. When dilatation is complete, the bag is expelled. Expulsion of the bag is usually followed by a profuse hemorrhage unless the presenting part can be crowded in and act as a tampon against the lower segment or podalic version is immediately performed. Therefore, it may be laid down as an obstetric axiom that the physician should never leave a patient with a bag in place, but should stay on guard until the patient is delivered.

In certain rare cases of placenta previa, when the blood loss has not been considerable; the fetus is viable at or near term; the cervix is unprepared; the genital tract is free from infection, and the woman is in good condition, cesarean section is the procedure of choice. Unfortunately, the large majority of previas are infected by meddlesome interference, through an unprepared vulva, before they fall into the hands of the obstetric specialist. Therefore, there are certain "don'ts" in placenta previa that should be emphasized.

(1) Don't examine a case of suspected placenta previa through a hairy, infected vulva.

(2) Don't examine the woman unless you have everything in readiness, and sterile, and are prepared to pack her; for frequently the most gentle exploration is attended by a torrential hemorrhage.

(3) Once the diagnosis is made, don't wait for another hemorrhage before terminating labor.

(4) Remember, when we pack, we plug, not the vagina, but the pelvis. Don't be afraid to use a sufficient quantity of gauze.

(5) Don't attempt manually to dilate the cervix, for you can't do it. You lacerate it.

(6) After podalic version is done, and a foot is drawn down, don't attempt to hurry the labor by traction. Treat her as if she were in shock. Secure a donor and allow the uterine contractions to effect a spontaneous delivery.

(7) Don't leave a patient with placenta previa until she is delivered, the uterus is firmly packed, and she has reacted from shock.

(8) Don't do a section for placenta previa, on a woman who is potentially infected.

Ablatio placentae usually occurs near term or during the first stage of labor. The hemorrhage is always primarily concealed, but later develops as an apparent bleeding with the escape of serum, blood or clots.

Ablatio is the partial or complete separation of the normally placed placenta before the child is delivered. The severity of the condition naturally depends on the degree of separation, for upon this depends the amount of hemorrhage. Consequently the result of treatment is largely dependent upon the time at which the diagnosis is made.

Three predisposing causes are recognized in the etiology of this condition: (a) a pre-existing toxemia, which predisposes by the formation of placental infarcts to loose attachment; (b) extreme uterine torsion, with thrombosis of the veins and uterine apoplexy; and finally (c) trauma, as kicks, falls and straining efforts. The great majority of cases have a history of pre-existing toxemia, evidenced by hypertension, albuminuria, etc. Whatever the cause, uterine contraction effects the separation.

A symptom complex makes the presumptive diagnosis. The patient is usually a multipara, or an elderly primipara, at or near term, or already in labor, with a history of an antepartum toxemia. She is suddenly seized with uterine pain referred to the region of the placenta, faintness, nausea or some degree of shock, evidenced by blanching, rise in pulse, and fall in blood pressure. Abdominal examination reveals a lignous uterus, tender and tense, or one flaccidly filled with retained blood which does not intermittently contract and relax. The fetal parts are obscured, the fetal heart labored or absent, the uterine contour smooth, hard or assymetrical, and when the presenting part is raised there is an escape of blood, serum or clots.

It is of clinical significance to remember that the symptom complex and the lignous uterus are the earliest diagnostic signs, and if treatment is instituted promptly, blood loss can be controlled.

Once the diagnosis is made, the pregnancy must be terminated, but how this shall be done depends upon the condition of the cervix, the size of the pelvis, the position of the fetus, and the contractility of the uterus. In multiparae with an ample pelvis rupture of the membranes, a vaginal plug, a firm abdominal binder with one-fourth grains morphin to combat the shock and favor dilatation, will usually suffice to control the intra-uterine bleeding. In addition to this, two or three minims of pituitary extract may be used at half hour intervals to maintain uterine contraction. If, however, distention of the uterus has already taken place, this plan of treatment will not control further bleeding.

In the primipara with an effaced cervix, we may also use puncture of the membranes, vaginal plugging and the tight abdominal binder. The clinician should sit down by her side and watch the pulse rate, the blood pressure and the hemoglobin reading, that he may determine whether the hemorrhage is controlled or whether the woman needs more active intervention.

Unfortunately, forceful delivery by the infravaginal route is fraught with great danger. Hence, if the labor does not progress and the hemorrhage is not controlled, as is shown by uterine distention, rise in pulse, fall in pressure and fall in hemoglobin percentages, abdominal hysterotomy is the procedure of choice. This is always so in cases with an unprepared cervix, where the accident has occurred, the patient is not in labor, and she shows signs of intra-uterine hemorrhage. In the presence of such a clinical picture abdominal section with coincident transfusion should be the method of attack, and if the uterus, on inspection, when the abdomen is opened, is ecchymotic, edematous and fails to contract, the operation should be hysterectomy, not hysterotomy.

Just as in placenta previa, there are certain facts which should be emphasized about ablatio: (1) that ablatio is a relatively common accident; (2) that a previous toxemia is a predisposing factor; (3) that many cases have an apoplectic origin from torsion of the uterus, and very few can be attributed to trauma; (4) that the symptom-complex is constantly present and makes the diagnosis, which may be confirmed on vaginal examination by raising the presenting part which allows the escape of serum, blood or clots; (5) that clinically this accident may be divided into two general classes,

the non-tragic and the tragic cases; (6) that prompt diagnosis determines the prognosis, for these cases rapidly pass from the non-tragic to the tragic stage, unless immediate treatment is instituted; (7) the immediate treatment of this accident should be rupture of the membrane, the application of a tight abdominal binder, and morphin to combat the shock; (8) in the tragic cases, which show progressive hemorrhage, fall in blood pressure and hemoglobin percentage, section after transfusion is the procedure of choice; (9) and finally, the decision between hysterotomy and hysterectomy depends on the condition of the uterine muscle.

DISCUSSION

Dr. Buford G. Hamilton, Kansas City, Mo.—In placenta previa the absence of pain with bleeding and the position of the placenta as determined by the stethoscope are diagnostic. In ablatio placentae, as the Doctor has said, there is a history of toxemia. The pain, while general, is most severe over the region of the placenta and is most often continuous. The circumference of the abdomen and the height of the fundus show gradual increase, as may be shown by actual measurement. The anxious expression of the patient and a tense tender uterus complete the diagnosis.

Two other classes of patients are seen: first, those whose pains become so frequent and severe as to cause a partial or total separation of the placenta. The second class, while few, consists of those who have had pituitrin. In all toxic cases the possibility of ablatio placentae should be kept in mind that early treatment may be instituted. In those non-toxic cases where close severe pains are present, morphin in appropriate doses should be started early. In placenta previa and ablatio placenta the treatment must depend on conditions. In all cases of bleeding from any cause where radical treatment is necessary the physician should be in attendance.

Dr. Calvin R. Hannah, Dallas, Tex.—I would like to ask Dr. Polak to differentiate between a clot due to ablatio placentae and a clot resulting from central separation of the placenta in a delayed third stage.

In treating hemorrhages of the last trimester, I always think it advisable, and believe it to be the duty of the attending obstetrician, to type each case and have the donor convenient for transfusion if necessary.

Dr. Polak (closing).—You will find that these ablatio clots are wrapped in folds of the placenta, are black, older and more organized, and more or less fill the cavity of the uterus after the placenta is expelled. While they do, there is little postpartum bleeding. The clot of normal separation is lighter in color, never organized and wholly within the inverted membrane.

AN APPRAISAL OF SURGICAL THERAPY IN PEPTIC ULCER*

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An estimate of the part that surgery plays in the treatment of peptic ulcer would not be complete if it did not at least make mention of the influence which early surgery exerted on the study and management of this condition. Although gastro-enterostomy, pyloroplasty and other operations had been performed by various surgeons during the latter part of the Nineteenth Century, they were not extensively utilized in the treatment of ulcer until the first few years of the present Century. Out of these numerous procedures there emerged one operation, namely, gastro-enterostomy, which early gained, and continues to hold, almost universal popularity as a valuable adjunct in the treatment of ulcer. Previous to the advent of surgery as a method of treatment, medical management had apparently been carried on in an indifferent manner with, of course, indifferent results. The results obtained in early surgery in properly selected cases were so vastly superior to the usual outcome of treatment by the other methods that the pendulum swung too far, and medical treatment appeared as well under way to be discarded altogether. But bad results in cases unwisely selected on the one hand, and from operations, perhaps, poorly executed on the other, soon served to dispel the idea that gastro-enterostomy alone was a cure-all. It may be stated that it was the failures in early surgery rather than the successes that led to the intensive study of ulcer by both surgeon and internist which has finally resulted in fixing a fairly definite place for each in treatment. The use of the combination is a vast improvement over either medicine or surgery employed exclusively.

The present status in the treatment of ulcer may be briefly summarized about as follows: (1) acute peptic ulcer is a medi-

*Read in Section on Surgery, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

cal condition which in the majority of cases yields readily to medical treatment. (2) Chronic ulcer is both medical and surgical. It is medical in that a sufficiently large number of cases yield satisfactory results to justify a thorough trial of the treatment in all cases before resorting to surgery. (3) Certain complications and sequelae of ulcer are indisputably surgical conditions. The principal of these are: perforating ulcer; repeating massive hemorrhages; pyloric stenosis and hourglass stomach. (4) In those conditions in which surgery is indicated the best results are obtained by the co-ordinated and combined efforts of surgeon and internist working together harmoniously.

This appraisal was primarily undertaken to deduce from the literature the best procedures for the various conditions which are admittedly surgical in peptic ulcer. Obviously it would be impractical, if not impossible, to trace the development of all the procedures up to their present status, and for the most part no attempt will be made to do it. It is very evident that there is not a unanimity of opinion among the leading surgeons as to what is a proper procedure in several conditions, and that this difference of opinion may be expected to persist until a new generation of surgeons arises. The basis of the different opinions is to be found largely in the varying conceptions of what peptic ulcer really is.

Pyloric Stenosis.—The procedure almost universally employed in the treatment of this condition is gastro-enterostomy, posterior without loop. There are surgeons who still employ some form of plastic operation on the pylorus with good results, while others resect the pylorus in addition to doing a gastrojejunostomy. This latter procedure seems to be justified if there is clinical or visual evidence of active ulceration. It seems that in a large majority of cases of pyloric stenosis such evidence is lacking, and since gastro-enterostomy alone gives nearly uniformly good results, the additional operative risk of resection is not justifiable.

Perforating Ulcer.—The mortality of non-operated perforating ulcer is so near 100 per cent that surgery is indicated as long as the patient is not moribund. If operated upon within a few hours from the time perforation has taken place, the mortality is remarkably low in comparison with the results obtained in perforation of other hollow viscera. The death rate very rapidly increases with the length of time operation is performed after perforation takes place. No definite procedure can be described as fitting all cases. The patient with perforating ulcer must be individualized. The surgeon is required to do two things in all cases of perforation, namely: first, he must close the perforation, and, second, he must remove from the peritoneal cavity as thoroughly as is practicable, all foreign material which has spilled through the stomach or duodenal perforation. Whether he resects the ulcer or makes a closure by some other method is determined by circumstances. It has been shown that resection of perforating ulcer is not essential in that many patients recover without excision never to have again a recurrence of ulcer symptoms. Most perforating ulcers of the stomach have broad, indurated bases, and closure is facilitated by excision of this area. If the ulcer is so situated as to offer mechanical hindrance to normal stomach function, gastro-enterostomy is indicated in addition to whatever method is employed in dealing with ulcer. The circumstances will determine whether more than the bare essentials of the immediate operation are feasible.

Drainage of the peritoneal cavity is not always required in operation for perforations. The spilling of any considerable amount of material which had been introduced into the stomach only a short time before perforation took place will render drainage advisable. Provision is usually made for drainage in the lower abdomen and the patient is placed in bed in the Fowler position. If food or drink had not been taken for several hours prior to the time of perforation, the contents of the stomach are practically sterile. The peritoneal irritation is chemical rather than infectious, and drainage is not always essential.

Recurring Massive Hemorrhages.—The internist is usually willing that the surgeon should operate upon such cases as have repeated massive hemorrhages. Apparently this complication of ulcer is not

encountered so frequently as formerly. This can only be explained by the improved methods of management as employed by physicians in recent years. It occasionally occurs in spite of good treatment, but is more often seen in cases that are untreated. The loss of blood may be enormous and the patient rendered pulseless. Surgical help will seem to be urgently demanded. If such a patient would survive an immediate operation in this condition, he would probably live until another day and be a much better surgical risk. To meet the indication in surgical attack on massive hemorrhage is to secure the bleeding vessel. This is usually most surely accomplished by excising the ulcer and thoroughly suturing the opening thus made. It is desirable, of course, separately to ligate the offending vessel if it can be readily located. Other procedures, if indicated, should be delayed until the patient has sufficiently recovered from the loss of blood to be in condition to withstand prolonged operation with the least possible risk to life.

Hour-glass Stomach.—This is a mechanical condition resulting from chronic ulcer and other causes. The problems of its surgical treatment are not those which are directly concerned in the treatment of ulcer, and will, therefore, not be further considered here.

Chronic Ulcer.—That chronic ulcer of stomach and duodenum which do not readily yield to medical treatment should be submitted to surgery is almost universally conceded. Some few surgeons advise that all chronic ulcers should be operated first and treated medically afterward (Deaver), but this advice is not widely heeded. Although it is conceded that a large percentage of chronic ulcers are surgical, there is by no means a uniformity of opinion as how to proceed. There are two principal factors which are largely responsible for this lack of unity among surgeons. The first has to do with the varying opinions as to the cause of ulcer. One group of surgeons, believing that ulcer was a result of physiological disturbance, undertook to develop an operation which would correct that disturbance. Another group conceived the idea that lack of proper drainage of the stomach was responsible for the chronicity of ulcer and devised a procedure which would correct this anatomical error, and so we had the "physiological" and "anatomical" operations.

The second factor, and a most important one, is the question of the relationship of chronic ulcer of the stomach to cancer. The cancer question has been a negligible factor in the treatment of intractable duodenal ulcer, and for this condition gastro-enterostomy alone has been very widely employed with good results. One of the very latest contributions on the subject (Judd and Rankin, *Surgery, Gynecology and Obstetrics*, August, 1923), however, recommends excision of the ulcer of the duodenum without gastro-enterostomy as a better procedure. It remains to be seen whether others will confirm this.

The debate as to the proper procedure in intractable stomach ulcer has been hotly waged for years. There is some hope from the evidence at hand that a decision will be forthcoming in the near future. Most of those surgeons who have doubted that there is a close relationship between ulcer and cancer have treated ulcer by performing gastro-enterostomy alone. The degree of success is largely determined by the proximity of the ulcer to the pylorus, poorest results being obtained in those cases in which the ulcer is farthest removed from the pylorus.

Those who believe that chronic ulcer is a precancerous lesion, and a few who are not so concerned with this question, have practiced excision of the ulcer area in addition to gastro-enterostomy. The mortality rate of the latter procedures are slightly higher than in gastro-enterostomy alone. Aside from this slight increase in the mortality rate in gastro-enterostomy plus resection, the immediate results of these operations are about equal. But there is convincing evidence in the literature that results are not so uniformly lasting in patients who have had only a gastro-enterostomy, and occasionally one will develop hemorrhage from, or even perforation of, the ulcer.

Briefly it can be stated that there seems to be an increasing tendency in favor of some form of procedure which eliminates

the ulcer in addition to a gastro-enterostomy in chronic ulcer. The main indication for resection of the stomach, or excision of the ulcer, is a belief in the close relationship of chronic ulcer to cancer. It is, therefore, highly desirable to determine, if possible, whether these procedures are accomplishing the main thing in view, namely, prevention of cancer of the stomach. Of the several noteworthy contributions on the subject of the relation of gastric ulcer to cancer, perhaps the paper by Ewing (*Annals of Surgery*, 1918, lxvii, 715) most thoroughly summarizes the facts of the situation. Nothing which would seriously alter the conclusions reached by Ewing have appeared subsequently. A summary, for the purpose of this paper, could not be better made than by a liberal extract of Ewing's paper.

"The relation of peptic ulcer to cancer of the stomach is a matter of first importance in the pathology of that organ, and since gastric cancer is the most frequent form of malignant disease, it is a matter of considerable economic importance. If gastric ulcer is a strongly predisposing condition to cancer, since it usually gives pronounced symptoms before reaching an inoperable stage of malignant change, ulcerocancer is the only type of gastric carcinoma which offers a favorable prognosis. On the other hand, if ulcers seldom result in cancer, it is unwise to spread the belief that by excising ulcers we are seriously attacking the problem of gastric carcinoma.

"There is the widest variation of opinion on the relation of ulcer to cancer. Lebert (1878) calculated that 9 per cent of cancers arise from ulcers, while Zenker (1882) went so far as to say that all gastric cancers are secondary to some form of ulceration. Futterer (1902) concluded that ulcers in the pyloric region frequently give rise to cancer, especially in those portions of the ulcer most exposed to irritation. Mayo-Robson is quoted as finding a history suggestive of ulcer in 59.3 per cent of his cases, but he reports only one case in which a carcinomatous change in an ulcer was actually demonstrated. The Mayo Clinic reports that 71 per cent of their gastric cancers were associated with ulcer, and 68 per cent of ulcers were complicated by carcinoma.

"Duplant (1898) described eight supposed cancerous ulcers and concluded that they were all originally cancers. He concludes that cancer never develops on peptic ulcer. Hirschfeld places the proportion of ulcers that become cancerous at 5 to 6 per cent. Among 500 ulcers reported by Stall, Greenfeld and Berthold, only 13 showed cancer, and in three of these the cancer was not connected with the ulcer. Beckelmann collects a series of estimates varying from 3 to 50 per cent. From the surgical side, various authors report proportions of cancerous transformations of ulcers ranging from none to 45 per cent.

"Thus among acceptable authors it is possible to choose between 2 and 68 per cent of ulcers becoming cancerous, and between none and 71 per cent as representing the proportion of gastric cancers that arise from ulcers. It is, therefore, evident that the criteria upon which one may assert that an ulcer is cancerous, or that a cancer has arisen from peptic ulcer, have never been clearly established or have not been respected. The evidence bearing on the relation of cancer to ulcer may be derived from several sources: statistical, clinical, gross anatomical and microscopical.

"*Statistical.*—Williams finds in England that there is a higher mortality from gastric cancer among men than among women, although women have a higher incidence rate of ulcer than men. Half the gastric ulcers occur between the ages of twenty and thirty years, and nearly all before thirty-eight, while most of the cancers occur between the ages of fifty and sixty.

"The seats of election of cancer and ulcer do not favor the frequent origin of one from the other. The commonest seat of ulcer is the lesser curvature (36.3 per cent) whereas only 12 per cent of cancers occur in this situation. The commonest seat of gastric cancer is the pylorus, 60 per cent occurring there, while only 12 per cent of gastric ulcers were thus located. The theory of the cancerous transformation of peptic ulcer would be more acceptable if there were parallels in other organs, but in the lip, tongue, tonsils, esophagus, rectum, larynx, cervix uteri, and in x-ray dermatitis there is first carcinoma and then ulceration.

"*Clinical Evidence.*—Since the development of cancer in peptic ulcer must require a considerable time, a history of gastric ulcer should be available in all cases so interpreted. Some gastric ulcers do not produce symptoms, but they are very rare and are usually small and superficial. Many authors have reported cases with a definite history of ulcer which subsequently became cancer, and some claim to be able to recognize, clinically, the cases of ulcerocarcinoma. While only about 40 per cent of ulcers are cured by medical measures, they very rarely develop into cancer while under observation. The results of gastro-enterostomy for ulcer reveal a small percentage of recurrences in the form of carcinoma, the average being about 2 per cent. Since the carcinoma usually develops within two years after the gastro-enterostomy, there is small reason to assume that some of the ulcers were originally cancerous. The number of cases developing cancer from ulcer after gastro-enterostomy is not appreciably larger than after resection of the ulcer.

"*Gross Anatomy.*—From the anatomical data one may conclude that the gross appearance of cancer grafted on ulcer is usually characteristic; that this evidence is the most direct and convincing in regard to the relation of the two processes, and should be demanded in acceptable cases; that ulcerating cancers may closely simulate peptic ulcers with secondary malignant changes, and that cancer and ulcer may occur independently in the same stomach.

"*Microscopical Evidence.*—The great majority of ulcerating lesions of the stomach fall clearly into the classes of ulcerating cancers, or simple peptic ulcers. With certain peptic ulcers a large part of the gastric mucosa is the seat of glandular hypertrophy with atypical changes in isolated glands and interstitial growth of connective tissue which causes some disarrangement of the glands. Deep excavations may occur in portions of established carcinoma, especially in the pyloric region. Gastric digestion may strip a primary carcinoma down to the muscularis, or deeper, leaving no trace of carcinoma over most of the base, but only a peripheral ring of tumor tissue which is protected by the mucosa. When the base of an ulcer is uniformly infiltrated with carcinoma, especially of diffuse or atypical small, alveolar type, the condition is difficult to reconcile with an origin from the edges of an ulcer. The occurrence of atypical epithelial proliferation in the glands on the edge of an ulcer is not sufficient evidence that the lesion is going on to cancer.

"From the above consideration the writer (Ewing) is forced to conclude that the cancerous transformation of peptic ulcer is rather infrequent, and probably does not exceed the incidence of 5 per cent originally established. The proportion would be much smaller if only those cases were included in which the evidence is demonstrative, viz.: a long history of gastric ulcer, the limitation of the tumor to isolated foci, or one portion only of the ulcer, and freedom of the base of infiltration."

The incidence of cancer of the stomach subsequent to gastro-enterostomy, according to available statistics, is 2.1 per cent, while following resection it is 1.9 per cent. In view of the extremely small difference in favor of resection, and when the increased mortality of resection operations is considered, no other conclusion can be drawn than that routine resection of ulcer as a prophylaxis of cancer is not a justifiable procedure.

DISCUSSION

Dr. Robert T. Miller, Baltimore, Md.—When the ulcer lesion is near the pylorus and is producing obstruction, gastro-enterostomy is usually very satisfactory. If the lesion is on the lesser curvature and not near the pylorus, patients are not apt to do well with gastro-enterostomy. It is probable that most of us have had cases in which gastro-enterostomy has not cured a chronic ulcer. In addition, there is a small percentage of pyloric ulcers which bleed even after gastro-enterostomy, and there are even cases with ulcer at the pylorus where gastro-enterostomy fails to give satisfactory results. It seems to me that it is correct to resect in order to remove the admittedly small number of precancerous ulcers, and that other reasons for pursuing this course in general are even more important. A tendency toward this course exists now and will probably increase with time. But until we have a large number of carefully analyzed cases we shall still be talking about our opinions, not about facts.

Dr. Arthur W. White, Oklahoma City, Okla. If the stomach is put in proper condition a simple type of ulcer will heal. Any ulcer that does not heal promptly under absolute correction of the stomach condition should be removed. Gastro-enterostomy will do no good unless it changes the conditions in the stomach which make the continuance of the ulcer possible. McCurdy called attention to the fact that in some ulcers which never become malignant there is a destruction of the second layer, and in the other type, which is always malignant, the third layer is destroyed. There is no way of knowing how deep is the involvement in a certain patient. The eradication of the ulcer that resists all efforts of healing is proper.

EYE, EAR, NOSE AND THROAT

TECHNIC OF A PAN-SINUS OPERATION*

By ROBERT C. LYNCH, M.D.,
New Orleans, La.

The indications for a radical procedure designed to cure a lesion which is represented by a chronic inflammatory process, involving the frontal, ethmoids and sphenoid, must be based on many circumstances.

If one happened to see an acute involvement of these sinuses with a rapid extension into neighboring parts (orbit or brain) one might conclude to adopt a procedure such as the one to be outlined. The above has so far not occurred in my experience.

The nearest approach was the case of a little girl eleven years old. She had edema of the lid and supercillary region, with redness, tenderness and heat, followed by fundus changes and slight exophthalmus. She had a negative Wassermann, with pus and polypi in the middle meatus, and pus coming from the sphenoid as determined with the pharyngoscope. This was a marked acute exacerbation in what was a chronic pansinusitis, as the maxillary sinuses showed the same pathology. She left the hospital two weeks after the pan-sinus operation, practically well.

Except for this one instance, in my 75 cases, it may be broadly stated that the radical pan-sinus operation was indicated after all else had failed. And even here one must make a certain allowance for varying the technic, depending upon the presence of a fistula that might make it necessary to change the route of the incision and do a little plastic work. I have had these, and in them after doing a little plastic work I brought about a cure with no deformity.

Since we are dealing with a chronic state of inflammation, which has existed in nearly every one for a good many months or even years, any consideration of an acute process would be out of order. Also, about 58 per cent of my patients had been subjected to from one to five operations, intranasal or otherwise, in unsuccessful attempts to bring about a cure or relief. They finally seek something else to eradicate the focus of infection when secondary symptoms manifest themselves.

Under normal conditions the lining membrane of the sinus is of the simplest order. It is made up of the thinnest type of mucous membrane, only scattered glands, proportionately few blood vessels, and these of very small calibre, periosteum and mucous membrane inseparably blinded and covered by ciliated cells which cease function, and cast off at the least evidence of inflammation, and once cast off are very slow to regenerate. This membrane receives all of its nourishment from outside sources: that is, the blood vessels enter the sinuses from either the nasal cavity or through the bony foramen. The periosteal covering does not furnish any nourishment to the bony cavity.

In every sinus cavity the bony wall forming the cavity receives its blood supply rather from without than from within. Is it any wonder that poorly developed membrane when once subjected to infection and inflammation or to repeated attacks of this process so readily undergoes degeneration?

In the process of degeneration with marked round cell infiltration, degeneration of its normal epithelial cells, arrest of function and casting off of its ciliated cells occur. There is perversion of the functions of the few gland nests that normally exist with polypoid formation of hyperplastic degenerative tissue. Nor can we facilitate its return to normal even by ample ventilation or drainage, or both, when the membranous lining of the cavity has been the seat of a chronic degenerative process of inflammation which has lasted for months or years. It ceases to be a mucous membrane. It is now a pathological membrane so distorted in its function as to have nothing in common with the normal.

In this state we see day after day the secretion we call pus, associated with

*Read in Section on Eye, Ear, Nose and Throat, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

polypi formation or hyperplasia. I cannot understand why we try to preserve this pathological state by methods of treatment which we term conservative, and in the next breath preach the total removal of the tonsil, because the least remnant left will reproduce itself and cause both local and constitutional phenomena. I am becoming firmly convinced that once the lining membrane is degenerated to the point of chronic pus formation with polypi, or hyperplasia without pus, no amount of ventilation or drainage will bring it back to normal. In this state it becomes one of the most fertile sources for a secondary toxemia with symptoms that cover every field of medicine. The lymphatic drainage ways are free and numerous and the only way to deal with such degeneration is to replace it with normal mucous membrane, which is as yet impractical, or with scar tissue.

In many of the cases we have noted cystic incapsulation of pus, showing some organisms of a virulent type. Not infrequently I have actually opened up an abscess cavity within this degenerated lining membrane, where the quantity of pus was equivalent to a dram. Cultures from a cavity of this kind have shown both staphylococci and streptococci. It is not customary, on the contrary, to find frequently any microscopical changes in the bone wall. This applies especially to the antrum, sphenoid and frontal sinuses. I have seen instances of roughened bone surface, or sequestra, or complete absorption. In the cases mentioned here these bone changes have been in the minority.

For these reasons I cannot see why there should be a cry about preserving such tissue in the cavity. One makes no attempt to do it in a tonsil, turbinate, gall bladder or appendix operation. The only difference is the locality. Certainly the function allotted to the accessory sinuses in man is not of a very high order, and living is converted into one of comfort and joy when a patient is relieved of this membrane by an operative procedure which has for its purpose the removal of every vestige of mucous membrane not only from the frontal, but from the ethmoids and sphenoids and antrums as well.

In a case of pan-sinusitis the antrums are attacked first by doing a Caldwell-Luc operation and at the same time a middle turbinectomy. Through the antrum opening I remove the lower group of ethmoid cells. When healing is under way I do the pan-sinus operation as described.

The principal of attack is fashioned after Knapp's operation. The details of the technic are ultimately responsible for the proper healing and the proper cure of the condition. The nasal cavity is prepared as for the nasal plastic surgery of the present time, alkaline douches with swabbing of 3 per cent iodin in alcohol, which will not destroy the surface epithelium, but has marked antiseptic value. Oral hygiene is likewise necessary, and teeth, gums and recesses are likewise covered with the same solution. A post-nasal plug is placed on the operative side and the strings left long enough to facilitate its removal upon the completion of the operation.

The skin surface is washed with alcohol and then ether in preference to benzine, and a solution of 5 per cent picric acid in alcohol is applied over the whole field covering both eyebrows, cheeks to upper lips and up to the hair line on both sides. While the staining of the skin may be objectionable in some cases, I have not found it so, and it does not blister the skin as does iodin. The eyebrow is carefully considered in the preparation, but is unshaven, as it is evident that the best cosmetic results are through the unshaven eyebrow. The eye is carefully washed with a bland solution, the lids are sealed together with sterile adhesive, and a cushion of gauze is laid over for its protection.

Cross cuts are made along the line of incision to get the proper approximation in closing of the skin and deeper tissues. The incision is as for the Killian or Knapp operation, but does not extend outwardly beyond the supraorbital notch until it is found by intra-sinus measurements that this is necessary. We proceed gradually through the periosteum and when this is accomplished all vessels are tied off. This is done with the smallest of catgut to prevent pressure from the forceps from injuring the eye.

The periosteum is elevated only from the lower half of the incision. If the periosteum is elevated over the frontal plate of the frontal bone, or represented by the upper half of the incision, it is not likely that it will reapply itself to the bone again, and in consequence there will develop either immediately or within three months a periostitis with elevation and a sequestrum with a final casting off. This has occurred on four or five occasions in my early sinus work, but I overcome this by adhering to the point. It will also protect the patient from a risk that an osteomyelitis may gain its start through this area, especially when the periosteum does not reapply itself quickly. The latter may happen either from too early blowing the nose or from operative edema that follows in some cases.

In elevation of the periosteum from the lower half of the incision great care must be taken not to buttonhole the orbital periosteum, as this may be followed by disturbances of the orbital balance. But the remotest area of orbit sinus wall must come into view. In elevating the periosteum over the nasal wall of the superior maxilla lower lateral edge of the nasal bone in the region of the upper portion of the lacrymal sac, which is carefully dislocated, and in the area of the superior oblique, which is also dislocated, a sharp groove or gouge is found to be the best instrument to use. A long submucous elevator exposes best the lacrymal and lamina papyracea of the ethmoid, in most instances extending backwards to within a few millimeters of the optic foramen. This is necessary to gain entrance to the post-ethmoidal cells and to give the widest field of approach to the anterior wall of the sphenoid.

It must be remembered that the angle formed by the orbito-sinus wall or floor of the frontal sinus with its posterior or brain wall must be completely obliterated, and especially is this true at the external angle; for this is the area that most harbors the infection which causes failure. When the common sinus wall of the orbit has been carefully removed, the mucous membrane of the frontal sinus is carefully curetted away and again any remaining mucous membrane, degenerated or not, will conduce to failure. I have not seen a sinus that will not permit a thorough curettage of the entire cavity with the Coakley curette. This done, a strip of gauze soaked in iodin is packed in the cavity to prevent or guard against any infection entering from below, and it will also control bleeding very nicely.

Two catgut sutures are now placed about half way in the cavity through the orbital periosteum. The ends are left long for traction sutures. I find this the best method of retracting the lower edge of the wound to give a better view of the deeper parts. The sutures can do no damage to the eye such as can be done by a Parker or rat tooth retractor. With the removal of the nasal process of the superior maxilla, the lower lateral edge of the nasal bone, the lacrymal and the entire lamina papyracea of the ethmoidal, there results a complete evisceration of the entire ethmoidal labyrinth. The middle turbinate has been previously removed and particular search is made for those orbital and sinus extensions of the ethmoid.

The roof cells of the ethmoid must receive our attention and these can be comfortably cleaned out by direct vision without the least fear of injury to the cribriform area. Sometimes I pass a stout probe, resting in the roof of the nose, through the nostril to act as a safety guide. The end of the probe rests in the sphenoidal sinus to act again as a guide when its anterior wall is reached. The post-ethmoidal sphenoidal cells, standing plainly in view, are broken down and every vestige of the mucous membrane is removed in this quarter. Finally the anterior wall of the sphenoid is removed entirely, to its limit, and its lining membrane is completely eviscerated. This is only possible by such an approach, and then even here I do not think it can be accomplished in every instance. In the group of cases there is one where this was not done well and I have had some trouble in controlling a persistent discharge, due to this fact. If the nose is cleaned and dried one can get the two angles of view for proper and comfortable orientation. The raw bone surfaces are carefully sponged with tincture of iodin and this is done as one of the first steps on the frontal

plate of the frontal bone. It is not necessary to disturb the nasal spine of the frontal or to open this cancellous area to the wound because it is fertile source for subsequent infection and will produce granulation tissue in abundance sufficient to interfere with drainage.

A drainage tube about a quarter of an inch in diameter is used, with one end cut on a bevel. It is passed through the vestibule of the nose and lies in what was the area of the beginning infundibulum of the sinus. The iodin gauze is removed from the upper portion of the sinus cavity, and the entire cavity is swabbed with iodin. If there has been bleeding from the post-ethmoidal sphenoidal region, a strip of iodoform gauze dipped in compound tincture of benzoin is packed loosely in the area to control hemorrhage. The frontal area does not bleed. Interrupted catgut sutures are used to bring the subcutaneous tissues together, but the needle point does not pass beneath the periosteum of the upper half of the incision, and they are placed with due regard to the cross cuts of the external incision.

The wound edges and the neighboring field are carefully cleaned with ether of all blood, and the skin is brought together with metal clips, using only enough tension to secure accurate approximation. No external drainage is necessary. The eye is now uncovered, carefully washed out again, and a fresh solution of argyrol instilled. About one ounce of sterile vaseline is placed over the closed eyelid, the quantity used acting as a protection to the eye. A crescent shaped dressing is placed over the incision, a large fluff of gauze is placed over the entire eye and wound and a bandage over all. The post-nasal plug is removed at once before the patient awakes from the anesthetic.

The gauze strip is removed from the nose in 36 hours and a sterile probe is passed through the tube daily to insure its patulency. The rubber tube is left in place for five days. The external bandage is removed in 36 hours, when the eye is left uncovered. The clips usually come out on the fifth day.

After the removal of the tube a large dilator or sound is passed into the sinus, and this is kept up usually for ten days, when the healing seems to be established and convalescence is complete. No washing of the sinus or nose is permitted and we feel the less the wound is interfered with after the operation, the more rapid and perfect is the healing. The discharge stops at once and of course does not recur. The healing is complete with a perfectly cicatrized nose, no scab formation and no discomfort.

In four of my cases the sinus extended to the hair line. No window was cut in the anterior wall, and they healed beautifully. In two cases there was a necrosis of the posterior wall with an exposure of the dura. In one, there was a large epidural abscess, producing marked exophthalmus (reported before the Southern Medical Association) and in every one of the cases no discharge, no scabbing and a perfect healing and perfect cosmetic results were obtained.

In the cases, most of whom I have had the opportunity to observe for one year or longer, there has been no recurrence of any symptoms which could have been attributed to the sinus infection nor has there been any reinfection of the original sinus operated upon.

Of the imperfect results mentioned, one died of meningitis due to an attempt to preserve a good cosmetic result in a sinus that was infected after operation. Had I opened the wound early, as I would do now, his life would probably have been saved. One had a colon bacillus infection at the time of operation. The wound was opened. His nose healed well, but he had a mild diplopia which persisted after six months. One got into a drunken brawl two weeks after operation, was struck forcibly over the eye, developed a periostitis and had to be operated upon a second time.

The results in the remainder of the cases are as good as could be asked for.

Discussion follows paper of Dr. Arbuckle, page 295.

DIAGNOSIS AND TREATMENT OF INFLAMMATORY DISEASE OF THE NASAL ACCESSORY SINUSES*†

By MILLARD F. ARBUCKLE, M.D., F.A.C.S., St. Louis, Mo.

Correct diagnosis of any diseased condition must be based on information obtained by careful and intelligent examination. In order to make such an examination in his field, the rhinologist must be intimately acquainted with the normal and pathological anatomy of the region under consideration, as well as with the clinical pathology.

In addition, it is imperative that he employ proper instruments and armamentaria in general, and certain adjuncts to complete the study of a given case.

Before examining the nose it is very important that a proper history be taken and that notes be made immediately. It is well to get the patient to tell (if he knows) in what way his nose is troubling him; to ask questions to bring out whether or not he has difficulty with breathing, a pain in the region of the nose or in the head, a discharge, a foul odor, frequent attacks of cold in the head, loss of or disturbed sense of smell, sneezing, hemorrhage, pain referred elsewhere, e. g., to the ear or mastoid, cervical region, etc., or eye disturbance or constitutional disturbance such as arthritis, asthma, cardiac or renal disease.

Patients will occasionally say that they have no headache, but that they have severe neuralgia or pain in a certain region. The time when pain occurs and its location is important. The writer has seen many instances in which the patient was sure his trouble was mastoiditis when really the pain was caused by an inflammatory condition in the sphenoid, with ganglion irritation.

An examination of the nose must include inspection and careful study of the sphenoid and posterior ethmoid region by posterior rhinoscopy, as well as careful study of the regions visible by anterior rhinoscopy.

It is, of course, possible with ordinary electric light, with or without lenses, to recognize gross changes or pus in considerable quantity, but in the opinion of the writer it is impossible with any but a pure white light to recognize, in many instances, signs which are diagnostic and of the greatest importance. The light referred to is the Lilliput arc lamp and the signs are pus in small quantity and inflammatory changes such as redness or swelling which are not marked. These signs frequently are overlooked or disregarded. In studying the regions just mentioned, it is important to remember that we may find positive evidence of inflammation without actually seeing pus.

It is not always easy to decide whether the color of the mucous membrane is normal and whether there is any pathological change in the contour or in the degree of moisture. The normal mucous membrane* is pink in color and moist but not wet. It is thin and smooth and covers the bone much the same as a thin, snug-fitting rubber glove covers the hand. When inflamed, the color is deeper and instead of being moist it is wet. It is thickened and the surface is not so smooth. It fits more like a thick leather glove than a thin rubber one. There may be any degree of thickening, slight or marked. Redness may be marked or slight and dilated vessels may or may not be visible.

After prolonged inflammation, small tufts of connective tissue are to be seen under the mucosa on the plica of the septum and on the rostrum of the sphenoid in the vicinity of the ostium of an involved sinus. In this instance the color is of a pale greyish shade. There are many variations in these departures from the normal. The wiping action of the soft palate frequently changes the picture by removing pus from the olfactory fissure, but it cannot wipe away the signs of inflammation, if they are present.

It is important to remember that sinus disease frequently is found in individuals

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*From the Department of Oto-Laryngology, Washington University School of Medicine.

†Read in Section on Eye, Ear, Nose and Throat, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

*Sluder, G.: Headache and Eye Disorders. St. Louis, Mo.: C. V. Mosby Co, 1918.

who have other disease which also gives rise to symptoms and complications like those of sinus disease. Therefore, it behooves us as rhinologists to work hand in hand with the internist, the oculist, the neurologist, the brain surgeon, the pediatrician, the dermatologist and the dentist.

It is at times impossible to decide by visual examination whether or not syphilis is present, but with a complete history and proper consultation the question usually can be settled. The writer has seen a case recently, however, in which a severe therapeutic test, (mercury and arsphenamin), was required to clear up the cause of osteomyelitis of the frontal bone.

The x-ray is of the greatest help in certain instances. Especially is this true in disease of the frontal and maxillary sinuses in the presence of long-standing inflammatory disease. This is an adjunct which I think will come to be of increasing importance to rhinologists. Good x-ray plates are very important, but poor ones are misleading and worse than none.

Transillumination in the writer's hands has been misleading and unsatisfactory. This probably is because of the varying thickness of the walls of the sinuses.

The naso-pharyngoscope is of great value in certain instances.

In speaking of treatment, the writer will deal only with chronic inflammatory disease.

In the presence of an accumulation of pus in any part, to secure free drainage is the most important of all treatment. In many instances, irrigation of a sinus which is the seat of an empyema accompanied by proper local treatment of the nasal mucosa is followed by recovery. In other instances, relief, if not entire recovery, may follow local treatment. If these methods fail to give relief more radical steps must be taken.

It is the opinion of the writer that many remedies are used in the nose which do more harm than good. This applies particularly to the numerous ones advertised in the lay publications and drug store windows.

Judging from the reports and the "free advice" column in the daily papers, as well as the happenings in one's own practice, it is getting to be quite the thing to "go and see my specialist and have a treatment for my sinus trouble."

In applying local remedies to the nasal mucous membrane it frequently is necessary to use a drug which by stimulating the vaso-constrictors will shrink the erectile tissue somewhat. Cocain probably is the least harmful and the most universally employed, but great care should be exercised by those responsible for its use. The writer has seen at least one addict to this drug whose habit was chargeable to the carelessness of a physician who had treated his nose.

Phenol, iodin, the silver salts and mercurochrome in various combinations and solutions have been most satisfactory in my work as local applications to the mucosa.

In treating chronic sinusitis of the milder, more recent type, there are, of course, many instances of satisfactory progress with local treatment alone. But in the severe, long-standing cases with marked tissue change and in those with constitutional disturbance more radical treatment is indicated. Free drainage by operative procedure is the only rational treatment in this class of cases.

There are rhinologists who teach that a deflected septum is the direct or indirect cause of many cases of sinus suppuration and that sub-mucus resection will relieve it and render operation on the sinuses unnecessary. The writer thinks this is rarely, if ever, true. There is no question that there is partial relief in many instances after a sub-mucus resection, but it is nearly always of short duration. In the dispensary of the Washington University School of Medicine, we have proven time and again that a septum operation is unnecessary and that relief of sinus suppuration was really obtained only after proper surgical treatment of the sinuses themselves.

Suppurative disease of the sphenoid and posterior ethmoid sinuses is rather more frequent, I think, than is generally conceded, and any surgical measure taken for the relief of empyema therein must be thorough and it must be applied to the

sinuses themselves. This is accomplished most satisfactorily by the Sluder method, (the essential feature of which is the downward and forward cut), in which method are combined more than in any other the elements of safety to the patient and certainty of accomplishing the desired result with less unpleasant after effects.

In doing the intra-nasal operation on the maxillary sinus, it is important, (almost necessary), to conserve the lower turbinate.

For cutting away the naso-antral wall the writer has had made a knife which is something like the Searcy trocar. This quickly and effectually cuts a window and it may be used for the same purpose in doing this step in the radical operation.

For relief of chronic empyema of the frontal sinus, it is the writer's feeling that an external operation offers greater hope of safe and sure relief.

The frequency of serious complications and of recurrence after intra-nasal operations on this sinus are well known.

The writer has employed for about two years an operation which consists in making an incision immediately below the unshaven eyebrow and removing the anterior wall of the sinus low down. The opening into the nose is enlarged forward and laterally until it will admit the tip of the little finger. The ethmoidal cells and the prefrontal cells are thoroughly cleaned out, the middle turbinate having been removed previously. A Thiersch skin graft is then placed so as to cover the newly made duct and the floor and walls of the sinus, including the interior of the flaps. This is held in tight apposition by a rubber balloon for about eight days. This graft "takes" and prevents granulation and closure.

CONCLUSIONS

(1) Satisfactory investigation, namely, light and vision with thorough examination, is essential to proper diagnosis.

(2) A thorough understanding of the normal is a prerequisite for the recognition of slight changes which often are pernicious.

(3) The flap valve action of the middle turbinate is an important factor in empyema of the sinuses draining into the middle meatus. If this be understood, it then becomes readily understandable that resection of the septum is not the keystone.

(4) For paranasal cell suppuration (particularly the frontal and antrum) which does not recover after comprehensive intranasal surgery, extra-nasal surgery serves.

(5) In the writer's experience, the Thiersch graft of the naso-frontal duct has been most advantageous in maintaining the result of the external operation.

DISCUSSION

Papers of Dr. Lynch and Dr. Arbuckle

Dr. G. B. Trible, Washington, D. C.—Without the proper light, a pure white light, it is more or less impossible to detect the presence of pus or changes in the mucous membrane such as are brought out in the Sluder Clinic. With an arc light such as is used there we have not had much success, but we find that the ordinary Spencer microscope light gives a very clear and beautiful picture.

The less irritating local drugs give the best results and suction, followed by irrigation and removal of secretions, and then tamponing with organic silver or mercurochrome usually gives a better effect than things that are more drastic.

The advantage of the x-ray well done and well interpreted in operative work cannot be gainsaid. The Bucky diaphragm gives sharp distinction and the bony outline is so clear that there is no question about the anatomical view. It will show up the fine markings where there is any bony change. But it is rather difficult to get the roentgenologist to use this diaphragm.

The operative work in this line in the Sluder Clinic surpasses anything I have seen. We owe them a great deal for the stress they have laid on sinus work, which goes back to Dr. Sluder's work in 1903 and 1904.

Dr. Virginius Dabney, Washington, D. C.—The first man in the country to do this operation was a graduate of the University of Virginia, who is still practicing in this city, Dr. Joseph H. Bryan. He has a fuller knowledge of this work and does the most surgically ideal operation on the sinuses of which I have any knowledge.

Similarly, the first ophthalmologist in America to establish definitely the causal relationship between sinus disease and the enlargement of the blind spot in the eye was a Southern man, graduate of the University of Virginia, Dr. Louis S. Greene, also of this city. The diagnostic and prognostic importance of his discovery is of enormous importance.

To attempt intranasally to cure a chronically diseased condition in a sinus, removed from di-

rect inspection, whose lining membrane is of necessity pathological, and whose interior is frequently divided into compartments by bony septa or deep depressions, where may be lodged growths all of which require removal or at least curettement, seems folly. Yet this is daily attempted by men of otherwise good judgment. This procedure involves the exenteration of the ethmoid, which, when done through the nose as a complete exenteration, is the most dangerous operation in the whole field of rhinology. I am cognizant of the work of Mosher, Freer, Yankauer and others, but I do not believe that these gentlemen attempt a complete ablation by the intranasal route, such as Dr. Lynch describes. I do not think it possible. The sphenoid, of course, is easily opened this way, but it is best left to be done at the time of the frontal operation, as Dr. Lynch does.

My preference is the technic introduced by Bryan, an incision along the entire hair line of the brow, and separation of the underlying periosteum, preparatory to the chiseling out of a narrow groove as far outwardly as may be necessary to see the extreme outward limit of the sinus. This gives direct inspection of all parts without tension on the nasal incision, leaving no perceptible scar, and the periosteum adheres solidly and permanently. Any subsequent periostitis or osteomyelitis is due to failure to remove diseased tissue at the first operation, especially if this is complicated by imperfect drainage.

I have had no personal experience with metal clips introduced by Michel for apposing the skin edges. I have been so impressed with the pain they seemed to cause that I still adhere to the use of black silk, which gives excellent apposition, is easily removed, and allows the use of a "coccon" dressing over the incision. A bandaged eye is uncomfortable to the patient and corneal abscesses and other pressure necroses are not uncommon when a bandage is used. The eye of the operated side should be cleansed frequently each day, as often as any secretion forms. Manifestly this is impossible if it is covered. The collodion dressing will take care of the wound seepage for the first two days, and can be changed then without any danger. In fact, I have done this at the end of thirty-six hours. The sterilization of the skin is easily secured before operation by the use of iodin, which is wiped off at once with alcohol. This prevents the scalding of which Dr. Lynch speaks and gives a double assurance of asepsis. This technic is simpler than his.

I never use any other operation than the Caldwell-Luc for the cure of chronic antrum disease. The Denker, Canfield and other intranasal antrum operations are enormously destructive and do not afford facility for dressing or inspection of the healing process or removal of exuberant granulations in the remote recesses. I feel that it is unwise to remove any part of the ethmoid through the antral wound, as Dr. Lynch does, as it would tend to destroy more of the nasal interior than is either necessary or desirable.

The object of the radical sinus operation is to secure and maintain adequate drainage, to remove all diseased tissue, and to preserve a good cosmetic result. These results Dr. Lynch's technic will certainly produce, though I feel he will often have to modify his frontal incision in the direction I have indicated to meet the extraordinary vagaries of contour and size of which the frontal sinus is capable.

Dr. Lee Cohen, Baltimore, Md.—The Killian, Knapp, Jansen, Kuhnt, Beck and Hajek operations, like that detailed by Dr. Lynch, all have for their object the removal of not only diseased tissues in the frontal sinuses and the establishing and maintaining of a large opening from the frontal into the nasal cavity, but also complete exenteration of the ethmoid cells and sphenoids of the infected side. Permanency of results depends upon the thoroughness with which all diseased tissues are renewed, no matter which plan we may pursue.

I have not been able to accomplish the desired results by working from beneath the orbital ridge only and leaving the front wall intact, as has Dr. Lynch. I find that unless the anterior wall is liberally removed I am much hampered in proper orientation and safe manipulation. Consequently, I have followed in a general way the Killian procedure, with happy results, not only as to cure but also as to cosmetic effect.

I should like to place on record the very gratifying results that I have obtained through the use of block anesthesia rather than general.

Dr. C. G. Coakley, New York, N. Y.—Every time I have re-operated one of my own cases, or those that have been done by others, there has been found in some portion, usually in the outer angle in that part of the frontal sinus that extends upward and outward from the orbit, a bit of the mucosa that has been overlooked from the previous operation.

There is another peculiarity about this condition, and that is that it lies dormant for six, ten, fifteen years without making any trouble at all. The patient is perfectly comfortable all that time, then suddenly, following some peculiar type of infection, possibly grippe, there is a flare-up, a swelling over the eye, intense headache, and we find that the area which has been dormant has suddenly become an acute process requiring immediate operation.

Another type of case is that of a slow, gradual accumulation of secretion frequently attributed to mucocele, that occurs in the infected portion of the mucous membrane.

I have not dared use the technic described by Dr. Lynch, for I have not the confidence in the curette that he has. I am afraid I will leave in the upper angle a little bit of the membrane, which may be there ten years before it gives rise to trouble. I would like to ask Dr. Lynch how long it is since the first case was operated upon?

Dr. Lynch.—Five years.

Dr. Coakley.—Of course the fact that so many of his cases have not given him more trouble is very much in favor of this operation, because as a usual thing they do not go five years before they give trouble. But I should very greatly fear that I could not get rid of that membrane through the incision he makes. If it can be done, of course it will leave a very much better looking scar and less deformity than the Killian operation.

Dr. W. P. Reaves, Greensboro, N. C.—I would like to ask Dr. Coakley whether the nature of the secretion has anything to do with spasmodic cough. Several of my patients have suddenly developed a spasmodic cough, and I have been of the opinion that it was because the drainage from the sinuses was of an acid nature. You will see an excoriated nose. Others with a great deal of secretion have not the spasmodic cough. The question is, is it bacterial decomposition that produces the acid condition?

If the roentgenologist diagnoses a case as sinusitis and transillumination does not verify it, you must look for something else. Is the tissue hypertrophied or is there a congested, inflammatory condition? The roentgenologist, the rhinologist, the dietitian and the general practitioner must cooperate in the diagnosis and treatment.

In about 95 per cent of cases, the selection of the internal or external operation depends upon the individual surgeon's acquired efficiency with that particular operation.

Dr. John J. Shea, Memphis, Tenn.—I have been doing Dr. Lynch's operation since his last paper and have a very nice series. In only one case have I had a poor result, and that was a case of bilateral sinus disease. Three feet away you cannot see that the patient has had a surgical operation. The trouble I have had has been that at some point in the anterior ethmoidal region there is a little pus.

No diagnosis is complete in sinus work if you do not use an arc light in making the examination. Examination of the posterior portion of the nose with an arc light and with any other light is entirely different.

Dr. John H. Foster, Houston, Tex.—The results following Dr. Lynch's operation are certainly good. One of the greatest advantages is the fact that the condition of the nose after the operation is better than after any other form of ethmoid operation that I know. Removal of the orbital wall allows the tissues to come in, and there is not that extreme dryness of the nose from an excessive amount of space.

Dr. Lynch (closing).—Of course the case presupposed an attempt at intranasal methods.

Metal clips, so far as I have seen, have not been painful.

The reason for not leaving the periosteum over the frontal bone was that I personally had a case of recurring abscess and osteomyelitis which occurred after the method. Dr. Dabney has not seen it. That is just two opinions.

I have had no experience with the burr, but I should be afraid to use it. Nor have I had any experience with local anesthesia.

Dr. Arbuckle (closing).—I have in some eight or ten cases, extending over a period of two and a half to three years, used the incision that Dr. Lynch uses in the frontal sinus operation, and so far I have not had any recurrence of the trouble in any of them. However, I can see, as Dr. Coakley has pointed out, that the condition might return later.

MISCELLANEOUS

MEDICINE AS AN INTERNATIONAL INFLUENCE*

By GEORGE E. VINCENT,
President, Rockefeller Foundation,
New York, N. Y.

Shakespeare in his great tragedies was accustomed to introduce comic relief in order to reduce the strain upon the audience, so in this list of professional speakers a layman is interpolated to give you a breathing spell in preparation for the second half of the program.

There is no intention even to outline the history of medicine, but rather to emphasize the international character of this body of scientific knowledge and technical skill which represents the contributions of all the leading nations of the world—a vast fund to which all have contributed and from which each may freely draw.

In an approximate way the medicine of the world and the methods of teaching it fall into three great systems: the British, the Latin, and the Teutonic. If on a map of the world the areas chiefly influenced by each of these types were to be indicated in a given color, the relationships could be brought out clearly.

Thus British medicine would appear in all the countries and centers around the world where British influence has been predominant: Canada, New Zealand, Australia, Hongkong, Singapore, India, South Africa, Egypt.

Latin medicine would include France, Belgium, Italy, Spain, Portugal; in varying degrees Russia, Rumania, Algeria, Syria, Indo-China, French Canada, Mexico, Central America, and South America.

German medicine is the leading factor in central Europe and has influenced largely Scandinavia, Holland, the Dutch East Indies, and Japan. It has been a significant force in Russia and in the United States and has affected countries like Argentina, Brazil, and Chile.

Yet such a map would be misleading. It would be hard to decide upon a color for the United States, for example, in which there has been a combination of British, German, and Latin elements. So in Canada and in many other places it is now impossible to say that medicine and medical education belong exclusively to any one type. Cross-fertilizing influences have been at work.

Nevertheless there is a value in keeping these systems in mind. Each has its outstanding virtues; each has its weaknesses. The great world problem is gradually through interchange of information and migration of personnel, to develop a cosmopolitan system of modern medicine which shall combine the best elements that can be found in all countries into a more intelligent and efficient means of combating disease and of fostering health.

It is inspiring to note how rapidly new ideas are being communicated throughout the scientific world. Gorgas had hardly finished his work in Havana before his ideas were taken up and applied in Rio de Janeiro, Santos, and Vera Cruz. Another striking illustration is afforded by the discovery of insulin, which was announced, as it seems, only the other day, but is now being tested all around the world.

You are to be most heartily congratulated upon being members of a profession which extends beyond national bounda-

*Abstract of Address, General Session, Southern Medical Association, Seventeenth Annual Meeting, Washington, D. C., Nov. 12-15, 1923.

ries—a great cooperative company in which each is conscious that anything of value he may contribute will be quickly put at the disposal of his colleagues throughout the world.

Here in the United States, as has been indicated, we are conscious of our debt to other countries. We owe much to Great Britain, to Germany, and to France. We hope that we are putting what they have given us to good use; adding to it; reorganizing it in such a way that we may make reciprocal contributions in return for what we have received.

Visitors from abroad have of late been studying our medical schools. They have found much to admire and have been generous in their praise. They have also raised a few questions. They wonder when our medical undergraduates, hurrying from laboratory to lecture room and from lecture room to clinic, get time to think. They fear that we are so interested in disease that we may forget the patient. We ought to welcome questions like these. They may have the useful effect of compelling us critically to examine ourselves and possibly to abate a little our complacency.

It would be a pleasure to conclude this address with an inspiring peroration which pictured men of all nations embracing each other in brotherly love. Before so intelligent an audience, aware of all the suspicion, hatred, antagonism to be found in the world today, it is quite impossible to indulge in mere rhetoric.

But because the outlook is dark and difficult is no reason why men and women should not work steadily day by day to promote those things which will help and not hinder the growth of a better spirit in the world.

You gather as representatives of the Southern states, but I would remind you that you are also members of the profession of the United States—and not of the United States only, but of Pan-America, and, furthermore, of the medical fraternity of all the world.

Out of the past comes down a great and noble tradition: the work of men of all nations. Into this heritage you enter. By correcting and purifying this inheritance; by adding to it new truth and technical resourcefulness; by fostering its spirit of loyalty and devotion across all national boundaries, you enjoy a great opportunity and a high privilege.

Southern Medical Journal

JOURNAL OF THE
SOUTHERN MEDICAL ASSOCIATION

Published monthly by the Southern Medical Association, Empire Building, Birmingham, Alabama. Annual subscription $3.00. Single copies 25c each.

Entered as second-class matter at the Postoffice at Birmingham, Alabama, under Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized December 20, 1921.

DR. M. Y. DABNEY, Editor
C. P. LORANZ, Secretary-Manager

Vol. XVII APRIL 1924 No. 4

EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Eighteenth Annual Meeting, New Orleans, La.
November 24-27, 1924

THE ETIOLOGY OF THE TOXEMIAS OF PREGNANCY

New theories are being advanced from time to time on the perplexing question of the etiology of toxemias of pregnancy.

Recently it has been claimed* that the toxemias have their origin in chronic foci of infection, usually in the teeth and tonsils. Emboli of bacteria are discharged into the maternal blood stream time and again from these foci and in consequence of their low virulence have but a gradual effect upon the various organs through which they circulate. They feed by preference upon carbohydrates and in consequence are a drain upon the glycogen content of the liver. There is a rapid demand for carbohydrates for the growing fetus in pregnancy, and this forms an added source of depletion of the glycogen content of the liver and leads to the symptom complex known as hyperemesis gravidarum. Instances are on record where the extraction of an abscessed tooth has relieved such a condition.

*Talbot: J. Obstet. and Gyn., December, 1923.

The maternal blood charged with these bacterial emboli coming in contact with the placenta finds a most fertile field for further development, since this is new and developing tissue. As the microorganisms enter the placental circulation, Nature attempts to limit the process by a protective thrombosis which results in the red infarcts so often seen in placentas. With their circulation cut off in consequence of the thrombosis, these in time become the white infarcts, practically dead spaces in the placenta, and may be the cause of early abortion.

The emboli of bacteria coursing through the other organs cause destructive changes that require an added stimulation of the sympathetic nervous system to overcome them. They interfere with elimination and a compensating increase in blood pressure is excited to overcome this deficiency. This is one of Nature's protective processes to increase elimination, as it has a reserve force for this purpose, and all goes well as long as the increase in blood pressure results in satisfactory elimination. With the retention of waste products and of water there is an increase in the bulk of the blood stream, which necessitates a dilatation of the whole vascular system.

Finally, when the increasing dilatation from within the blood vessels is greater than the contracting power of the muscular structure surrounding the arterioles, edema or the passage of the excess fluid into the tissues results in the dependent parts of the body. With the increase in blood pressure albumin shows in the urine, an indication actually that the toxemia has been existing for some time. As the condition continues, the strain upon the sympathetic nervous system finally becomes too great, the arterioles dilate, and edema of the tissues results. The action of the toxins of the bacteria upon the sympathetic nervous system

causes intestinal paresis. The bacteria circulating in the liver feed by preference upon its glycogen content, thereby creating a carbohydrate deficiency, and this gives practically the full complex of pre-eclamptic toxemia. With a system so surcharged with destructive changes, only a slight added stimulus such as removal to a hospital, a vaginal examination or beginning treatment is required to incite a convulsion.

Eclampsia accordingly may be not the result of a single infection, but the final failure on the part of the system to combat repeated discharges of infective organisms circulating in the maternal blood stream.

THE MENTALLY CRIPPLED CHILD

There is no appeal so strong, or so freely and generously responded to, as the appeal for physically crippled children. It is sad to realize, however, that the mentally crippled child, and there are as many, if not more, than there are physically crippled, receives but scant attention from those philanthropically disposed, or from the state. A few scattered and meagerly supported state colonies for the definitely feeble-minded tell the whole tale. There seems to be a widespread erroneous idea that little or nothing can be done for the mentally defective child.

The prevention of the mentally crippled child lies first in eugenics. The public has not been sufficiently taught the necessity, nor have adequate laws been passed for the prevention, of the marriage of the insane, epileptic, mentally feeble, morally degenerate, syphilitic, tuberculous or the pauper. And it is from the defective children of these defective parents that the majority of the illegitimates and future defectives come. Prevention of the mentally crippled also includes the strictly medical questions of the prevention and early recognition and early correction, of birth injuries. This is a problem to be overcome by stricter attention to the newly-born.

Later, when the mentally crippled child is recognized as such, careful physical and mental examinations must be made and the mental and emotional grade of the child established. Regulation of the child's environment, training, operative procedures at times, education, opportunity and encouragement are then necessary. Regulated occupation suited to the capabilities of the patient must be given and for those hopelessly crippled the proper institutional provision must be made.

Many children become mentally crippled because of some acquired injury, endocrine disturbance, disease or because of the non-correction of some minor defect. It is difficult for the uninitiated to realize what inestimable benefit may accrue from some comparatively simple head operation, from the administration in selected cases of thyroid or pituitary gland extract, or from a careful correction of a refractive error.

What is needed is for the profession and the laity to become interested in the mentally afflicted child, for well financed and well officered children's psychopathic clinics to be established in every community, for the maintenance of enlarged, more numerous, better financed and equipped colonies for defective children, and for all to take an optimistic attitude toward the whole subject. And last but not least is needed the support of the profession for the National Committee for Mental Hygiene which is endeavoring in a very scientific way to aid both the profession and the country in the cause of the mentally crippled child.

THE PHYSICIAN IN POLITICS

Medical sages and medical philosophers, of the type of Oliver Wendell Holmes and Sir William Osler, have all warned physicians to beware of politics, which they believed was incompatible with the training and duties of the profession. By that is meant politics for self-advancement or popularity. Such a person is usually a better politician than doctor, and with him medicine becomes a mere side line. This advice is as good today as when it was uttered.

A UNIQUE CLUB

In Jefferson County, Alabama, some hundred and fifty physicians have deliberately organized, not for selfish reasons, as charter members of an openly and avowedly political club, known as the Physicians' Civic League of Jefferson County.

It so happens that the state law delegates the selection of the board of health largely to the physicians; but the weak link in the chain is politics, in that the appropriation of maintenance funds is in the hands of politicians. In Jefferson County the controlling faction has a sufficient number of members not in sympathy with public health progress to block many progressive measures, and to jeopardize the health interest of the largest and most influential county in the state.

At last an opportunity for a reaction arrived when the courageous and efficient County Health Officer, Dr. J. D. Dowling, who had been previously taken out and assaulted by masked vandals, was awarded the Birmingham News Loving Cup for 1923 on the grounds that he had rendered the broadest and most valuable service to the community of any citizen during the previous year. This directed much attention, and gave the greatest impetus, to public health work that had ever been known in the district, and made possible the organization of the Physicians' Civic League.

REQUIREMENTS FOR MEMBERSHIP

This League is composed entirely of "ethical physicians in good standing." No one holding an office carrying with it any financial remuneration from the state or any of its sub-divisions, and no one a candidate for such an office, is eligible to membership.

PURPOSES OF THE LEAGUE

The constitution states the objects of the League to be:

(1) The enlightenment of the public in matters of health preservation and health and welfare legislation;

(2) The ascertaining of candidates' views on the maintenance of an efficient and adequate health department;

(3) The dissemination among the public of the results of these investigations; and

(4) The consolidation of the power and influence of the medical profession to the end that only candidates favorable to progressive health and welfare measures be supported.

The formation of the Physicians' Civic League marks the dawn of a new era in politics. It is the first time in the history of the world that physicians as such have organized a non-partisan, non-selfish political club purely for the purpose of informing the public about health matters, for influencing the popular vote for better health laws, and for the election of more enlightened office holders.

The physician is usually the best beloved and most influential person in a community, and, therefore, this League is a potential factor for immense good so long as general politics is eschewed and the original purpose of the organization is strictly adhered to. This experiment in Alabama will be watched with deep interest by the rest of the country. Its success will mean widespread adoption of its tactics.

Book Reviews

Movement in Organic Disease. By Ernest Kingscote, M.B., C.M. (Edin.), Honorary Physician to St. Pancras Dispensary. 187 pages. Illustrated. New York: William Wood & Co., 1924. Cloth, $3.50.

The first part of the book is given to an illuminating discussion of the statics and dynamics of the chest, giving tables of what the author considers the normal respiratory excursions, and his exercises and methods of restoring the normal movements in disease such as emphysema.

Following this is a discussion of the anatomy of the heart with a rather indefinite discussion of the Nauheim treatment and resisted movements in the treatment of cardiac dilatation. Thus far the book is good. Like many men with a hobby, the author rides his too far and the last part of the book is given to the discussion of the treatment of asthma, pulmonary tuberculosis, diabetes mellitus and other conditions by the same methods. What he calls asthma is probably the so-called cardiac or renal asthma. In tuberculosis his ideas are rather contrary to the best usages of today, and in diabetes it is hard to see how the most vivid imagination could lead to the claims advanced. If the last part of the book were left out it could be said to be both interesting and instructive.

Dosage and Solutions, a text book for nurses and a reference book for physicians and nurses. By C. E. Garnsey, Instructor in Anatomy, Physiology, Hygiene, Bacteriology, Dosage and Solutions, Hydrotherapy and Chemistry in the Washington Sanatorium and Hospital Training School for Nurses, Washington, D. C. 111 pages. Philadelphia and London: W. B. Saunders Co., 1924.

The author in his preface stresses the fact that in order to teach we should present our subject in such a manner that the maximum amount of information will be gained and retained by those instructed. In this he has been most successful.

This is a simple and useful presentation.

The Biology of the Internal Secretions, the Endocrine Factor in the Development, in Subnormalities, in Neoplasms and Malignancy, in Nervous and Mental Diseases and in Heredity. By Francis X. Dercum, M.D., Ph.D., Professor of Nervous and Mental Diseases in the Jefferson Medical College; Member of the American Philosophical Society; Member of the Academy of Natural Sciences of Philadelphia. 241 pages. Philadelphia and London: W. B. Saunders Co., 1924.

The subject is divided into twenty-one sections under which is discussed the biology of internal secretions. The book is original in many of its deductions. Stress is laid upon the importance of the mesenchyme as a factor in glandular dysfunction and as a possible causative factor in malignancy.

The Medical Clinics of North America, March, 1924, St. Louis Number. Published Bi-Monthly. Philadelphia and London: W. B. Saunders Co. Paper, $12.50 per year.

These clinics are looked forward to by many readers and the present number is up to the average which medical readers have become accustomed to expect from this publication.

The subjects presented show a great diversity. It is impossible to select any one clinic as better than the rest.

Other Books Received.

Lectures on Endocrinology. By Walter Timme, M.D., Attending Neurologist, Neurological Institute, New York; Professor of Endocrinology, Broad Street Hospital; Professor of Nervous and Mental Diseases, Polyclinic Medical School and Hospital. With 27 illustrations and 120 pages. New York: Paul B. Hoeber, 1924. Cloth, $1.50.

Sexual Problems of Today. By William J. Robinson, M.D., President, American Society of Medical Sociology; President, Northern Medical Society of the City of New York; Editor of the Journal of Urology and of the Critic and Guide; Ex-President, Berlin Anglo-American Medical Society. Twelfth edition, with 340 pages. New York: The Critic and Guide Co., 1923. Cloth, $2.50.

The Care of the Baby. A Manual for Mothers and Nurses, Containing Practical Directions for the Management of Infancy and Childhood in Health and in Disease. By J. P. Crozer Griffith, M.D., Professor of Pediatrics in the University of Pennsylvania; Physician to the Children's Hospital; Consulting Physician to St. Christopher's Hospital for Children. With 478 pages. Seventh Edition, Thoroughly Revised. Philadelphia and London: W. B. Saunders Co., 1924.

Oral Hygiene. By J. Sim Wallace, D. Sc., M. D., L. D. S., Lecturer on Preventive Dentistry, King's College Hospital, Formerly Dental Surgeon and Lecturer on Dental Surgery and Pathology, London Hospital. With 76 pages. London: Bailliere, Tindall & Cox, 1923. Cloth, $5.00.

The Editor's Wants and a Way of Filling Them. Baltimore: Williams & Wilkins Co., 1924.

Southern Medical News

CHILD HEALTH MAGAZINE

Mother and Child, the official publication of the American Child Health Association, has changed its name to The Child Health Magazine and doubled its pages in size. The January issue was the first appearance under the new name. The Journal concurs most heartily in the following official announcement: "With this issue, Mother and Child, for the last four years the official publication of the American Child Health Association and the American Child Hygiene Association, becomes The Child Health Magazine. We hope you will think that the changed form is a vast improvement and that you will like the increased content and scope of the magazine. We ask you to consider this issue as the first step in transforming a pioneer publication into a big national journal of child health activities."

POST-GRADUATE CLINIC TOURS

Inter-State Post-Graduate Clinic Tour to Canada, British Isles and Paris in 1925 is now being arranged under the supervision of the Managing-Director's office of the Tri-State District Medical Association. The time for leaving will be about the middle of May. The tour will consume approximately two months' time and the cost from Chicago and back to that point will be less than $1,000, which will include all clinic arrangements, admissions, traveling expenses, etc., except meals on Pullmans in America. Clinics are being arranged in Dublin, Belfast, Liverpool, Manchester, Leeds, Edinburgh, Glasgow, Newcastle, London and Paris and other points. Applications should be made to Dr. William B. Peck, Managing-Director, Freeport, Ill.

ALABAMA

The Medical Association of the State of Alabama will hold its annual meeting in Montgomery, April 15-18.

Calhoun County Medical Society has elected Dr. Jerre Watson, President; Dr. C. Hal Cleveland, Vice-President; Dr. G. G. Woodruff, Secretary; Dr. E. C. Anderson, Treasurer.

The thirteenth annual clinic and the sixth annual meeting of the John Andrew Clinical Society (colored) was held at the John A. Andrew Memorial Hospital (colored), Tuskegee Institute, March 21-April 5.

Deaths

Dr. Oscar Copeland, Red Bay, aged 67, died January 15 from diabetes mellitus.

ARKANSAS

The Arkansas Medical Society will hold its annual meeting in Fayetteville, May 20-22.

The following Fort Smith physicians have been commissioned in the Medical Officers' Reserve Corps: Majors C. P. Wilson and R. F. Parks; Captains W. R. Brooksher, Jr., A. F. Hoge and C. S. Bungart.

Arkansas County Medical Society has elected Dr. C. W.

Rasco, DeWitt, President; Dr. E. B. Swindler, Stuttgart, Vice-President; Dr. R. H. Whitehead, Gillett, Secretary.

Chicot County Medical Society has elected Dr. J. S. Wilson, Lake Village, President; Dr. E. Baker, Dermott, Vice-President; Dr. B. C. Clark, Lake Village, Secretary.

Conway County Medical Society has elected Dr. H. E. Mobley, President; Dr. B. C. Logan, Vice-President; Dr. W. H. Bruce, Secretary-Treasurer.

Crawford County Medical Society has elected Dr. S. C. Grant, Mulberry, President; Dr. M. S. Dibrell, Van Buren, Vice-President; Dr. J. A. Wigley, Mulberry, Secretary; Dr. O. M. Bourland, Van Buren, Treasurer.

Garland County Medical Society has elected Dr. O. E. Biggs, President; Dr. O. H. King, Vice-President; Dr. T. N. Black, Secretary-Treasurer.

Phillips County Medical Society has elected Dr. H. H. Rightor, Helena, President; Dr. J. W. Bean, Marvell, Vice-President; Dr. J. W. Nichols, Helena, Secretary.

Polk County Medical Society has elected Dr. B. E. Dunman, Mena, President; Dr. P. R. Watkins, Mena, Vice-President; Dr. F. C. Mullins, Grannis, Secretary.

Saline County Medical Society has elected Dr. W. W. Ward, Alexander, President; Dr. J. D. Wright, Mabelvale, Vice-President; Dr. J. M. Phillips, Benton, Secretary; Dr. E. A. Buckley, Bauxite, Treasurer.

Searcy County Medical Society has elected Dr. A. S. Baker, Snow Ball, President; Dr. J. A. Henley, Marshall, Vice-President; Dr. Sam G. Daniel, Marshall, Secretary-Treasurer.

Sevier County Medical Society has elected Dr. R. L. Hopkins, President; Dr. C. E. Kitchens, Vice-President, Dr. C. A. Archer, Secretary.

Dr. Frances Sage Bradley, Little Rock, has resigned as Director of the Bureau of Child Hygiene of the State Board of Health.

Deaths

Dr. Arthur C. Ellis, Hot Springs, aged 42, died suddenly February 23 from acute indigestion.

Dr. John P. Hight, Fayetteville, aged 80, died January 19 from senility.

DISTRICT OF COLUMBIA

A joint meeting of the Medical Society of the District of Columbia with the Baltimore Medical Society was held March 8 in Baltimore.

Dr. J. W. Peabody, Superintendent of the Tuberculosis Hospital of the District of Columbia, Washington, has been appointed Assistant Professor of Clinical Medicine, Georgetown University, Washington. He will continue his duties with the tuberculosis hospital.

Deaths

Dr. Francis A. Mazzei, Washington, aged 60, died January 11.

FLORIDA

Duval County Medical Society has elected Dr. James B. Parramore, President; Dr. Shaler A. Richardson, Vice-President; Dr. F. A. Copp, Secretary; Dr. John K. Norwood, Treasurer, all of Jacksonville.

Articles of incorporation of the Duval County Medical Society were completed and ratified January 26 at a special meeting called for that purpose. This was done under the laws of Florida permitting incorporations not for profit. Under the reorganization, all the officers holding over from 1923 and the new officers elected at the annual election in December were re-elected as officers of the corporation.

As a social feature, the Duval County Medical Society has instituted semi-monthly noonday luncheons, now being held at Seminole Hotel, Jacksonville.

The Duval County Medical Society has a publicity committee which releases to the daily papers such news and transactions of the Society as might be of interest to the public.

At a meeting of state organizations for the promotion of health education in public schools January 26, in Jacksonville, a State Health Education Council was formed. The Council will coordinate the health education work of organizations in the State to promote health education. A speakers' bureau was established and will furnish trained lecturers on health subjects. The State Teachers' Training Institutions will be asked to add to their curriculum, for both winter and summer sessions, a course of study in health education. The following organizations were represented at the meeting: The State Medical Association; State Board of Health; Bureau of Child Welfare; State Department of Education; American Red Cross; Florida State College for Women; Home Economics Department; Modern Health Crusade; University of Florida; State and County Dental Societies; State Federation of Women's Clubs and the State Parent-Teacher Association.

Deaths

Dr. William Alexander Stanley, Lakeland, aged 55, died suddenly January 29 from cerebral hemorrhage.

Dr. Hyman H. Pulsipher, Jacksonville, aged 86, died January 23 from paralysis.

GEORGIA

The Medical Association of Georgia will hold its seventy-fifth annual meeting in Augusta May 7-9. This will be their Diamond Jubilee.

Bartow County Medical Society has elected Dr. W. C. Griffin, Cartersville, President; Dr. H. B. Bradford, Pine Log, Vice-President; Dr. T. Lowry, Cartersville, Secretary-Treasurer.

Bulloch County Medical Society has elected Dr. W. E. Simmons, Metter, President; Dr. A. Temples, Statesboro, Vice-President; Dr. F. F. Floyd, Statesboro, Secretary-Treasurer.

Burke County Medical Society has elected Dr. H. A. Macaulay, Waynesboro, President; Dr. B. H. Smith, Keysville, Vice-President; Dr. J. B. Lewis, Waynesboro, Secretary-Treasurer.

Campbell County Medical Society has elected Dr. R. T. Camp, Fairburn, President; Dr. T. J. Busey, Tyrone, Vice-President; Dr. A. J. Green, Union City, Secretary-Treasurer.

Cherokee County Medical Society has elected Dr. Thomas J. Vansant, Woodstock, President; Dr. Grady N. Coker, Canton, Vice-President; Dr. George C. Brooke, Canton, Secretary-Treasurer.

Clarke County Medical Society has elected Dr. Linton Gerdine, Athens, President; Dr. H. I. Reynolds, Athens, Vice-President; Dr. Jos. S. Stewart, Jr., Athens, Secretary-Treasurer.

Cobb County Medical Society has elected Dr. E. M. Bailey, Acworth, President; Dr. W. M. Kemp, Marietta, Vice-President; Dr. L. L. Blair, Marietta, Secretary-Treasurer.

Cook County Medical Society has elected Dr. H. W. Clements, Adel, President; Dr. S. G. Etheridge, Sparks, Vice-President; Dr. L. R. Hutchinson, Adel, Secretary-Treasurer.

Decatur-Seminole County Medical Society has elected Dr. Gordon Chason, Bainbridge, President; Dr. J. I. Spooner, Donalsonville, Vice-President; Dr. J. P. Lewis, Bainbridge, Secretary-Treasurer.

Floyd County Medical Society has elected Dr. M. M. McCord, President; Dr. R. O. Simmons, Vice-President; Dr. J. H. Mull, Secretary-Treasurer.

Fulton County Medical Society has elected Dr. W. E. Person, Atlanta, President; Dr. Theodore Toepel, Atlanta, Vice-President; Dr. G. E. Clay, Atlanta, Secretary.

Grady County Medical Society has elected Dr. J. B. Warnell, Cairo, President; Dr. J. V. Rogers, Cairo, Secretary-Treasurer.

Henry County Medical Society has elected Dr. J. G. Smith, McDonough, President; Dr. J. B. Weldon, Vice-President; Dr. W. P. Sloan, McDonough, Secretary-Treasurer.

Irwin County Medical Society has elected Dr. G. W. Willis, Ocilla, President; Dr. S. L. McElroy, Ocilla, Vice-President; Dr. L. L. Whiddon, Ocilla, Secretary-Treasurer.

Johnson County Medical Society has elected Dr. T. L. Harris, Wrightsville, President; Dr. S. M. Johnson, Wrightsville, Vice-President; Dr. J. G. Brantley, Wrightsville, Secretary-Treasurer.

Richmond County Medical Society has elected Dr. T. D. Coleman, President; Dr. C. J. Montgomery, Vice-President; Dr. J. D. Gray, Secretary-Treasurer.

Talbotton County Medical Society has elected Dr. J. B. Douglass, President; Dr. J. E. Peeler, Vice-President; Dr. C. C. Carson, Secretary-Treasurer.

Thomas County Medical Society has elected Dr. J. B. King, Thomasville, President; Dr. S. L. Cheshire, Thomasville, Vice-President; Dr. C. K. Wall, Thomasville, Secretary-Treasurer.

Walton County Medical Society has elected Dr. H. L. Upshaw, Social Circle, President; Dr. J. B. H. Day, Social Circle, Vice-President; Dr. J. K. McClintic, Monroe, Secretary-Treasurer.

Warren County Medical Society has elected Dr. F. L. Ware, Warrenton, President; Dr. H. L. Earl, Jewell, Vice-President; Dr. A. W. Davis, Warrenton, Secretary-Treasurer.

(Continued on page 34)

Effervescing tablets Triple Bromides 15 Grains.
S & D

Solmides contain five grains each of the Bromides of Ammonium, Sodium, and Potassium. The smaller size tablet containing two and one-half grains of each of these Bromides.

Solmides are recommended in the treatment of all conditions in which the Bromides are indicated. As Solmides are effervescent they are quickly and perfectly soluble. A tablet dissolved in a glass full of water makes a sparkling and palatable draught, and will be found more acceptable to many patients than the ordinary form of bromide medication.

Solmides are offered in tubes of 25 tablets.

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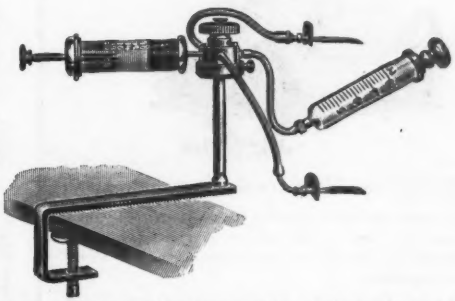
THE Unger Transfusion Apparatus is designed with the idea of expediting blood transfusion combined with an accurate method of gauging the amount of transfusion and eliminating the possibility of clot or air injections.

It consists of a carefully ground revolving "well" by which the blood can be drawn from the donor and injected into the recipient by the pumping action of a 20 cc Record syringe and only entailing a half turn of the wheel on top of the well. The apparatus is also supplied with a 20 cc Luer syringe for the injection of saline. This can be used for both eliminating the air from both canulas before the machine is put in operation, and a continuous small amount of saline can be injected throughout the transfusion, the amount recommended by the author being about 1 cc of saline to each 20 cc of blood.



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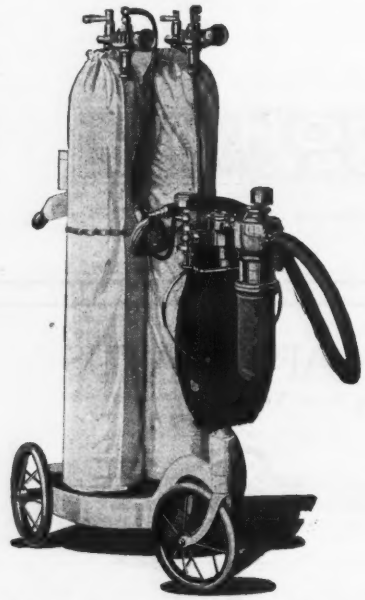

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Toledo Technical Appliance Co.

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Toledo, Ohio.

(Continued from page 304)

The Clinical Congress of the American College of Surgeons, Georgia-Alabama-Florida Section, held their annual meeting in Atlanta January 21-February 1.

The State Legislature has enacted a special tax providing a $500,000 appropriation for a new sanatorium at Alto.

Dr. W. A. Walker has opened a hospital at Cairo.

Dr. W. W. Crook, Cuthbert, is taking a post-graduate course at Tulane Polyclinic, New Orleans, La.

Dr. Lisbon C. Allen, Hoschton, and Miss Isabelle Canning, Flowery Branch, were married December 27.

Deaths

Dr. William F. Walker, Preston, aged 58, died January 31.

Dr. Susan Mary Hicks, Atlanta, aged 78, died February 18 from senility.

Dr. Augustus Moody Burt, Macon, aged 73, died January 19 from senility.

KENTUCKY

At the first annual banquet of the Jefferson County Medical Society in Louisville, February 4, a committee was appointed to plan a memorial for Dr. Lewis S. McMurty, former President of the Society, and other physicians who have died during the last few years.

The cancer campaign which was conducted in Kentucky for one month closed with "Cancer Week," which began on March 9.

Representatives of the Kentucky Animal Rescue League and the School of Medicine of the University of Louisville have been negotiating an agreement concerning dogs consigned to the city pound. The contract has been that the city pound shall furnish to the School of Medicine not more than 250 dogs per year. A nurse employed by the Animal League will at all times have access to all rooms where animals are kept in the School.

Dr. Orrville Ray Miller and Miss Alice Ross Trent, both of Louisville, were married January 30.

Deaths

Dr. Leslie L. Robertson, Middlesboro, aged 55, died January 23.

Dr. Alban Moorman, Yelvington, aged 79, died February 16 from chronic nephritis.

Dr. Jacob Patrick Shacklette, Louisville, aged 51, died February 3.

Dr. William W. Hyatt, Willisburg, aged 62, died January 28 at the Louisville City Hospital from burns received in a fire at his hotel.

Dr. Edgar William Stokes, Louisville, aged 46, died January 24 from heart disease.

Dr. Franklin A. Miller, Ensor, aged 66, died January 9.

Dr. Mark Insko, Bratton, aged 75, died February 12 from pneumonia.

LOUISIANA

The Louisiana State Medical Society will hold its annual meeting in Opelousas April 22-24.

Lafourche Valley Medical Society has elected Dr. Hugh P. St. Martin, Houma, President; Dr. Henry C. Dansereau, Labadieville, Vice-President; Dr. Hubert S. Smith, Thibodaux, Secretary.

(Continued on page 36)

The Thompson Sanatorium

For the treatment and education of tuberculous patients. Seventy-five miles northwest of and twelve hundred feet higher than San Antonio. Mild winters, cool breezy summers. Hospital Building and Hollow Tile Cottages with modern conveniences. Beautiful mountain scenery. Prices moderate. Trained nurses.

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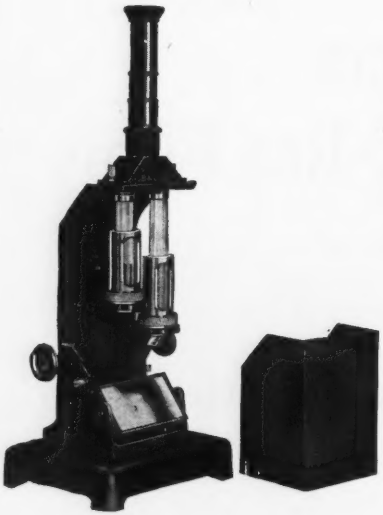

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Surgical Instruments, Hospital, X-Ray and Laboratory Supplies, BIRMINGHAM, ALA.

(Continued from page 34)

The first of a series of post-graduate or "refresher" courses given by the staff of the Shreveport Charity Hospital closed on February 9. This course was conceived by the staff in the belief that as a state institution it was not only their duty to treat the sick and to train nurses and young physicians, but to offer to the practicing physicians of the State an opportunity to "refresh" their medical skill in the form of a definite course in modern methods. The curriculum included two hours daily in the out-patient department covering the treatment of all types of disease in ambulant patients, one hour daily of demonstration of special methods of diagnosis and treatment, one hour of clinics on diseases of especial interest, and one hour of general clinics in the wards of the Hospital.

At the six courses of instruction in methods of using insulin offered at Touro Infirmary during the last year, 246 physicians from Mississippi, Texas, Alabama, Florida, Arkansas and Louisiana attended. Two more courses will be given in April; one was given March 17-20 for negro physicians.

In the reorganization of the State Health Board the following new members have been named: Drs. C. P. Brown, New Orleans; Joseph T. Abshire, Abbeville; J. Ernest Brown, Lake Providence; Theophilus T. Tariton, Grand Coteau; Walter F. Couvillion, Marksville; Mr. E. H. Daste, druggist, New Orleans; Mrs. L. C. McVoy, teacher; Mr. Frederick Ranzburg, dentist, Shreveport.

Dr. Benjamin F. Gallant, formerly Superintendent of St. Luke's Private Hospital, has purchased the "Inn by the Sea" at Henderson Point and fifteen acres of ground for $30,000. He will establish a convalescent hospital, with accommodations for about 150 patients. Two modern brick buildings will be erected at once.

Dr. Richard L. DeSaussure, of the American Child Health Association, is assisting the State Board of Health to establish a full-time health unit and child health demonstration program at Baton Rouge. The program, operating entirely under state and local forces, will introduce health education in the schools, to give midwives proper training, and instruct mothers in the care of the pre-school child. The State Board of Health has appropriated $200 a month to maintain a child health clinic.

The new science building at Tulane University, New Orleans, was formally opened February 21. The building contains experimental laboratories for the natural and medical sciences.

Dr. John H. Cooper, Alexandria, has been appointed Superintendent of the new Louisiana Masonic Home for Orphans which will be erected at a cost of $145,000.

Additional buildings will be erected at the Flint-Goodrich Hospital for Negroes, New Orleans, to meet the increased demands.

Dr. Henry John Otto and Miss Wilhelmine Anna Eckendorff, both of New Orleans, were married January 16.

Deaths

Dr. Marcus Breckenridge Tarleton, Jeanerette, aged 65, died January 18.

MARYLAND

The Medical and Chirurgical Faculty of Maryland will hold its annual meeting in Baltimore April 22-24.

The year ending January 31 was the busiest in the history of Johns Hopkins Hospital. An average of 1127 patients were treated daily, 483 in the hospital wards and rooms and 544 being examined and treated through the out-patient department. A large part of this work was done free of charge. About $495,000 was spent by the Hospital on the free care of the sick.

Plans have been completed for a new dispensary for the Johns Hopkins Hospital to be erected at a cost of $1,000,000. It will be a seven-story building erected on the site of the present dispensary; $750,000 will be expended for equipment. An endowment of $1,000,000 has been provided for operating the dispensary. This endowment has an income of $100,000.

A public health center for the Second District of Baltimore County was organized recently at the Randallstown High School.

The Book and Journal Club of the Medical and Chirurgical Faculty of Maryland was held at Osler Hall February 19.

Dr. and Mrs. Clarence Warfield, of Anne Arundel County, have made a $39,000 bequest to the University of Maryland for scholarships for medical students who come from counties in the State and who intend to practice medicine in the counties. The income from this bequest will be

(Continued on page 38)

THE NEW YORK TIMES.

CHEMISTS ENDORSE GELATIN AS FOOD

Experiments With Baby Clinics Show Nutrition Value When Mixed With Milk.

An Important Aid to Digestion—Ration of Gelatin and Oats Recommended.

Special to The New York Times.

PITTSBURGH, Pa., Feb. 2.—Chemists at the Mellon Institute of Industrial Research, University of Pittsburgh, have recently completed a scientific investigation of the food value and dietetic importance of gelatin. As a result of this study they announce that gelatin is of much greater importance as a food than is generally realized. Hitherto it has been popularly regarded chiefly as something to make other foods more attractive and palatable, but now, the chemists say, it should receive more and more consideration for its own nutritive value.

The report deals with the raw materials used in making gelatin, the process of manufacture, its dietetic properties and its food uses.

An Aid to Babies.

Co-operative experiments with baby clinics, the report asserts, have shown such remarkable results from the use of gelatin in infant feeding and malnutrition of children that the serious attention of the medical profession is called for. It tells of babies who lost weight on the usual milk formulas, but recovered when 1 per cent. of gelatin was added, and of children who could take gelatin with milk or cream when nothing else agreed with them. The report also sets forth the value of gelatin for convalescents and invalids, especially those suffering from fever, tuberculosis and diabetes.

The greatest benefits derived from the use of gelatin as a food, the report adds, come when it is combined with other foods, such as cereals, bread, milk, eggs and ice cream. It points out that the addition of small quantities of gelatin to ice cream not only makes this delicacy more palatable, but actually increases its food value and makes it easier to digest.

Valuable Addition to Diet.

The report says that gelatin is a valuable addition to the diet because it is easily digested, saves protein, aids in the digestion of other foods, especially milk and milk products, has remarkable supplementary value when fed with many protein foods, and has useful physiological effects.

Gelatin is one of the easiest proteins to digest, the report adds. It also says that gelatin materially decreases the waste of body nitrogen.

"Dr. Krummacher concluded from a series of tests," the report continues, "that gelatin supplies the body with energy, and hence prevents the cleavage of body protein."

Dr. Thomas B. Downey of the Mellon Institute, according to the report, has found that 5 per cent. of gelatin in a ration containing 9 per cent. of rolled oats proteins, added salts and vitamins, is adequate for the normal growth of the animals used in the experiments. The animals fed on this ration, without the gelatin, grew at only one-half the normal expectation, but the addition of 5 per cent. of gelatin was followed by their return to normal weight and apparent health.

"This research," says the report, "shows the wisdom of the liberal use of milk with rolled oats and oatmeal as a breakfast food. In addition, it demonstrates the advantage to be obtained by including gelatin therein. This improvement can be made easily by the addition of granulated gelatin to the cooking cereal some five or ten minutes before its removal from the double-boiler."

The report also says that white wheat bread and whole wheat bread probably would be increased in nutritive value by the addition of gelatin.

The report says that Dr. Downey has listed seventy-five distinct applications of gelatin to food uses. One of the most interesting recent discoveries, it adds, is that gelatin adds to the food value of ice cream as well as making it smoother and more palatable.

Physicians, Nurses and Dietitians

should read this reprint from The New York Times on the health value of Gelatine, of which the highest and purest grade is Knox Sparkling Gelatine.

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"The Highest Quality for Health"

Charles B. Knox Gelatine Co.

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(Continued from page 36)

used to aid worthy medical students. Resolutions by the Alumni Association provide for five four-year scholarships of $300 a year.

The Veterans' Hospital at Perryville will have a $1,000,000 addition. The new building will take care of psychoneurotic patients in Maryland, Virginia, West Virginia and Pennsylvania. The present structure has accommodations for 500 patients, and the addition will provide for 500 additional patients.

Dr. J. Clement Clark was given a dinner at the Baltimore Club March 1 in honor of the twenty-fifth anniversary of his superintendency at the Sprinfield State Hospital. The dinner was given by eighty of Dr. Clark's friends who presented him with a silver loving cup.

The new wing of the Maryland General Hospital, formerly the nurses' home, was opened February 8. It has twenty-eight private and ward rooms with a capacity for seventy patients.

Deaths

Dr. William Durbin Brown, Keedysville, aged 51, died January 20 from heart disease.

MISSISSIPPI

The Mississippi State Medical Association will hold its annual meeting in Jackson May 13-15.

Hancock County Medical Society has elected Dr. Alvah P. Smith, Bay St. Louis, President; Dr. H. S. Lewis, Bay St. Louis, Vice-President; Dr. John A. Mead, Logtown, Secretary, re-elected.

Dr. O. O. Jones, Meridian, announces the opening of a completely equipped x-ray laboratory with practice limited to roentgenology.

Deaths

Dr. John Overton Pratt, Biloxi, aged 42, died January 22.

MISSOURI

The Missouri State Medical Association will hold its annual meeting in Springfield May 6-8.

Caldwell County Medical Society has elected Dr. George S. Dowell, Braymer, President; Dr. Tinsley Brown, Hamilton, Secretary-Treasurer.

Cape Girardeau Medical Society has elected Dr. C. A. W. Zimmermann, President; Dr. A. E. Dalton, Vice-President; Dr. D. G. Seibert, Secretary; Dr. O. L. Seabaugh, Treasurer.

Chariton County Medical Society has elected Dr. John Hardy, Sumner, President; Dr. R. M. Fellows, Salisbury, Vice-President; Dr. J. D. Brummall, Salisbury, Secretary-Treasurer.

Cooper County Medical Society has elected Dr. A. L. Meredith, Prairie Home, President; Dr. H. D. Quigg, Boonville, Vice-President; Dr. P. A. Brickey, Boonville, Secretary-Treasurer.

Dunklin County Medical Society has elected Dr. Chas. W. Brown, Sr., Kennett, President; Dr. Paul Baldwin, Kennett, Vice-President; Dr. T. J. Rigdon, Kennett, Secretary-Treasurer.

Gasconade-Maries-Osage Medical Society has elected Dr. M. E. Spurgeon, President; Dr. S. E. Gaston, Meta, Vice-President; Dr. F. J. Wessling, Freeburg, Secretary-Treasurer.

Henry County Medical Society has elected Dr. Josiah H. Walton, Windsor, President; Dr. Edwin C. Peelor, Clinton, Vice-President; Dr. Robert J. Jennings, Windsor, Secretary-Treasurer.

St. Louis County Medical Society has elected Dr. Clyde P. Dyer, President; Dr. C. A. Dunnavant, Vice-President; Dr. Otto Koch, Secretary-Treasurer.

Plans are being made to erect a new $175,000 hospital in Cape Girardeau.

Cape Girardeau County Medical Society has begun the publication of a monthly bulletin. The first number appeared in January. Dr. W. K. Statler, Oak Ridge, is Editor.

A $250,000 men's infirmary building will be erected at Koch. In addition to this, the Board of Public Service contemplates an $85,000 building for women employees and a $50,000 recreation building for the Robert Koch Hospital.

Under the will of the late Mrs. Nannie M. Wright, St. Louis, the St. Louis Children's Hospital is given $7000 to furnish a ward in memory of her daughter. It will be called the "Ann Wright Hazeltine Ward." Under this will the St. Luke's Hospital is the recipient of $1000, as is also the St. Louis Home of the Friendless and the Little Sisters of the Poor.

The Shriners' Hospital for Crippled Children, St. Louis,

(Continued on page 40)

It's Sharp BARD-PARKER KNIFE It's Sharp

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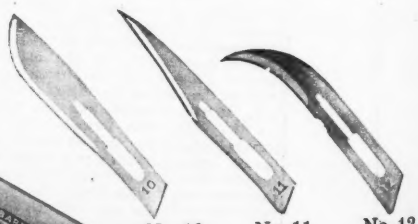
Blades Nos. 10, 11 and 12 are interchangeable on Handle No. 3.

Blades Delivered in Envelopes containing 6 of one size; Doz., $1.50. Handles, each, $1.00.



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S. M. A. requires no modification or change for normal infants. As the infant grows older the quantity is merely increased.

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Cleveland, Ohio

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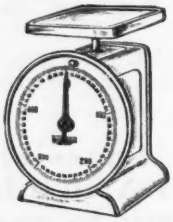

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(Continued from page 38)

which was erected at a cost of $650,000, was formally opened March 1. Dr. Leroy C. Abbott has been appointed Chief Surgeon.

A committee has been formed for the purpose of making an effort to raise $750,000, the amount needed to complete the $2,000,000 Jewish Hospital, St. Louis. The building, when erected, will provide for a capacity of 250 beds.

Plans have been completed for the erection of a $25,000 building at Springfield Hospital.

The sixth annual meeting of the Western Electro-Therapeutic Association will be held in Kansas City April 17-18.

Dr. Percy J. Farmer and Miss Viola Scruggs, both of St. Louis, were married February 4.

Deaths

Dr. Mabelle Van Horn Goessling, St. Louis, aged 58, died recently from carcinoma of the bladder.

Dr. Leonidas C. Ross, Springfield, aged 63, died February 4 in a local hospital.

Dr. Ferdinand Brase, Jackson, aged 60, died February 5, following a long illness.

Dr. Warren E. Harlan, St. Louis, aged 47, died January 16 from pneumonia.

Dr. R. Walter Mills, St. Louis, aged 45, died February 16 at St. Mary's Hospital, Rochester, Minn., from acute lymphatic leukemia and appendicitis.

Dr. James William Russell, Longtown, aged 58, died recently from heart disease.

Dr. Calvin Jenkins Morrow, Kansas City, aged 63, died recently from carcinoma.

Dr. Samuel Milton Clark, Kansas City, aged 69, died January 7 from aortitis.

Dr. John Wilson Williams, Nashville, aged 49, died January 29 from pneumonia.

Dr. Charles McVey Chapman, Shelbina, aged 57, died January 22 from pneumonia.

NORTH CAROLINA

The Medical Society of the State of North Carolina will hold its annual meeting in Raleigh April 15-17.

Catawba County Medical Society has elected Dr. T. C. Blackburn, Hickory, President; Dr. Geo. W. Shipp, Newton, Vice-President; Dr. W. G. Bandy, Maiden, Secretary-Treasurer.

The Mission Hospital, Asheville, erected at a cost of $200,000, was formally dedicated December 20. The old frame structure will be torn down.

The State Board of Education and Governor Morrison have voted against teaching in the public schools of the State any phase of evolution which makes it appear that man descended from a lower order of animals.

Dr. R. G. Tuttle announces the removal of his office from Walnut Cove to Winston-Salem.

Dr. Thomas C. Johnson, Lumberton, has leased the Thompson Hospital and will continue its operation. He has had charge of the institution since the death of Dr. N. A. Thompson two years ago.

Dr. William Harvey Dixon, Rocky Mount, and Miss Margaret Freeborn Betts, Richmond, Va., were married January 19.

Dr. Walter Edward Futrell, Morganton, and Miss Phoebe Palmer, Sanford, were married in Richmond January 18.

OKLAHOMA

The Oklahoma State Medical Association will hold its annual meeting in Oklahoma City May 13-15.

Atoka County Medical Society has elected Dr. Thomas H. Briggs, Atoka, President; Dr. Charles C. Rose, Atoka, Vice-President; Dr. Charles C. Gardner, Secretary-Treasurer.

Beckham County Medical Society has elected Dr. E. S. Kilpatrick, Elk City, President; Dr. W. D. Oliver, Erick, Secretary-Treasurer.

Greer County Medical Society has elected Dr. Ney Neel, Mangum, President; Dr. E. M. Poer, Mangum, Vice-President; Dr. J. B. Hollis, Mangum, Secretary-Treasurer.

Marshall County Medical Society has reorganized and elected Dr. T. A. Blalock, Madill, President; Dr. P. F. Robinson, Madill, Vice-President; Dr. W. D. Haynie, Kingston, Secretary-Treasurer, re-elected.

Pushmataha County Medical Society has elected Dr. H. C. Johnson, Antlers, President; Dr. John A. Burnett, Crum Creek, Secretary-Treasurer.

Sequoyah County Medical Society has elected Dr. T. F. Wood, Sallisaw, President; Dr. S. B. Jones, Sallisaw, Vice-President; Dr. E. P. Greene, Sallisaw, Secretary-Treasurer.

(Continued on page 42)

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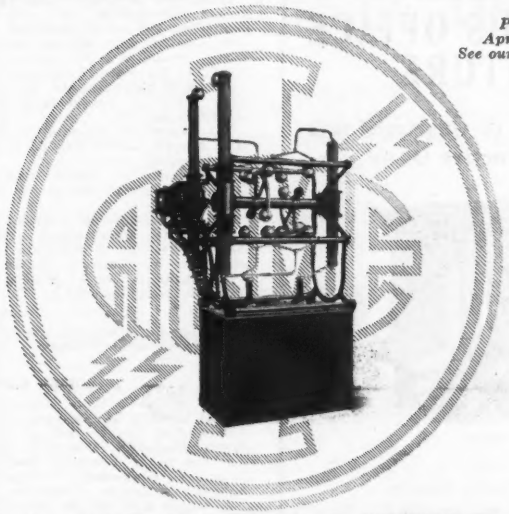

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College Hospital, Ames, Iowa.
Johns Hopkins Hospital, Baltimore, Md.
University Hospital, Baltimore, Md.
Boston City Hospital, Boston, Mass.
Rhode Island Hospital, Providence, R. I.
Northwestern Hospital, Minneapolis, Minn.
Swedish Hospital, Minneapolis, Minn.
St. Barnabas Hospital, Minneapolis, Minn.
University of Minnesota, Minneapolis, Minn.
Kansas City General Hospital, Kansas City, Mo.
St. Luke's Hospital, Kansas City, Mo.
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St. Vincent's Hospital, Billings, Mont.
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St. Luke's Hospital, New York City, N. Y.
Eastman Kodak Co., Rochester, N. Y.
Jewish Hospital, Cincinnati, Ohio.
Springfield City Hospital, Springfield, Ohio.
University of Oklahoma, Oklahoma City, Okla.
Jefferson Hospital, Philadelphia, Pa.
University of Pennsylvania, Philadelphia, Pa.
Philadelphia General Hospital, Philadelphia, Pa.
Pennsylvania Hospital, Philadelphia, Pa.
U. S. Naval Hospital, Philadelphia, Pa.
City Hospital, Nashville, Tenn.
Baylor Hospital, Dallas, Texas.
St. Joseph's Infirmary, Houston, Texas.
St. Luke's Hospital, Richmond, Va.
University Hospital, Charlottesville, Va.

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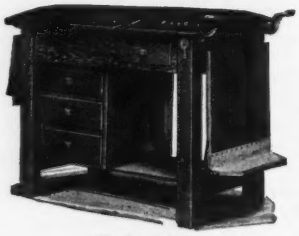

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(Continued from page 40)

Tri-County Medical Society has elected Dr. A. S. Risser, Blackwell, President; Dr. J. C. Wagner, Ponca City, Vice-President; Dr. J. C. Hawkins, Blackwell, Secretary.

Wagoner County Medical Society has elected Dr. T. J. Shinn, President; Dr. Samuel R. Bates, Vice-President; Dr. C. E. Hayward, Secretary-Treasurer, all of Wagoner.

Contracts have been let for Oklahoma City's new Physicians' Building. The building will have a capacity of 400 to 500 rooms.

The Woodward Hospital and Ross Hospital, Woodward, have merged, and it will be known as the Woodward General Hospital.

Dr. Charles E. White, Pawhuska, has been appointed City Physician in charge of the new Muskogee General Hospital.

Dr. C. D. Simmons, Stillwater, has resigned his connection with the Oklahoma A. and M. College. He has been College Physician at Stillwater for the past ten years. He will make his home in Florida.

Dr. Shade D. Neely, Muskogee, and Miss Leila Roberta Hampton were married at Tulsa January 6.

Deaths

Dr. George Strickland, Claremore, aged 66, died January 7, following a long illness.

SOUTH CAROLINA

The South Carolina Medical Association will hold its annual meeting in Orangeburg April 15-17.

Darlington County Medical Society has elected Dr. W. L. Byerly, Hartsville, President; Drs. A. B. Hooton, Darlington, and G. B. Edwards, Darlington, Vice-Presidents; Dr. Julian T. Coggeshall, Darlington, Secretary; Dr. J. W. Willcox, Darlington, Treasurer.

A bronze bust of the late Dr. Benjamin Walter Taylor has been placed in the Columbia Hospital, Columbia. Dr. Taylor's grandson unveiled the memorial February 6.

A new hospital for negroes of Columbia and Richland County was recently opened. The hospital, known as the Waverley Hospital, will be operated by Dr. N. A. Jenkins.

Dr. Stonewall Jackson Blackmon, Kershaw, and Miss Sue Morrison, Fountain Inn, were married December 31.

(Continued on page 44)

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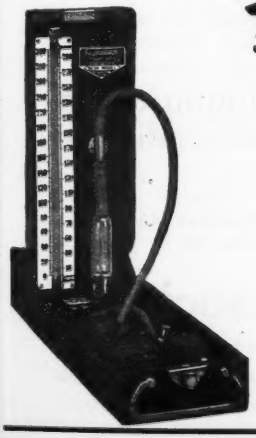

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(Continued from page 42)

Deaths

Dr. David Oliver Leonard, Reidsville, aged 58, died January 17.

Dr. William Paterson Cornell, Columbia, aged 46, died suddenly February 24 from angina pectoris.

TENNESSEE

The Tennessee State Medical Association will hold its annual meeting in Knoxville April 8-10.

Bradley County Medical Society has elected Dr. T. E. P. Chambers, Cleveland, President; Dr. R. L. Bean, Cleveland, Vice-President; Dr. H. W. Harris, Cleveland, Secretary-Treasurer.

Giles County Medical Society has elected Dr. A. W. Deane, Pulaski, President; Dr. W. J. Johnson, Frankewing, Vice-President; Dr. C. A. Abernathy, Pulaski, Secretary; Dr. G. D. Butler, Pulaski, Treasurer.

Grundy County Medical Society has elected Dr. W. P. Stone, President; Dr. C. W. Hembree, Vice-President; Dr. E. C. Lindsey, Secretary, all of Tracy City.

Hardeman County Medical Society has elected Dr. W. H. Siler, President; Dr. J. Y. Alexander, Vice-President; Dr. E. R. Timmons, Secretary-Treasurer.

Lincoln County Medical Society has elected Dr. E. K. Flair, Fayetteville, President; Dr. J. P. Farrar, Shelbyville, Vice-President; Dr. C. L. Goodrich, Fayetteville, Secretary-Treasurer.

Loudon County Medical Society has elected Dr. G. M. Hall, President; Dr. Halbert Robinson, Vice-President; Dr. J. G. Eblen, Secretary-Treasurer.

Macon County Medical Society has elected Dr. M. H. Allen, President; Dr. East, Secretary-Treasurer.

The Kentucky-Tennessee Section of the American College of Surgeons met in Nashville January 28-29.

Plans are being made to enlarge the Medical, Pharmaceutical and Dental Departments of the University of Tennessee, Memphis, so that the institution may be increased from 400 to 800 students.

Ground has been broken for the new $100,000 Crook Sanitarium, Jackson.

Dr. B. B. Parrish, Dresden, has been appointed a member of the medical staff of the Government Hospital for disabled World War veterans, Johnson City.

(Continued on page 46)

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(Continued from page 44)

Dr. Julian G. Price has been elected President of the Dyersburg General Hospital, Dyersburg.

Dr. R. E. Mason was recently elected President of the staff of St. Joseph's Hospital, Memphis.

Dr. P. L. Henderson has been re-elected City Physician of Morristown.

Recently R. J. McDowell, styling himself a representative of Mayo Brothers, went to Springfield and sought to locate a hospital. It was learned before his skin game worked that McDowell is not a physician nor a representative of Mayo Brothers, but is a faker.

Deaths

Dr. R. W. Colville, Dayton, aged 81, died December 17.

Dr. Charles T. Cory, Chattanooga, aged 76, died January 9.

Dr. Mumford W. Ellis, Clarksville, aged 67, died January 28, following a brief illness.

Dr. Harvey Thomas King, McKenzie, aged 66, died in Elreno, Okla., January 23.

Dr. W. C. Kirkland, Sparta, aged 41, died January 16 following a long illness.

Dr. William E. McCampbell, Nashville, aged 69, died January 24.

Dr. Samuel A. McDonald, Linden, aged 72, died recently at Tulsa, Okla., from cerebral hemorrhage.

Dr. L. L. Robertson, Middlesboro, died January 23, following a brief illness.

Dr. William Pleasant Robinson, Nashville, aged 40, died suddenly January 21 from heart disease.

TEXAS

The State Medical Association of Texas will hold its annual meeting in San Antonio April 29-30-May 1.

Bastrop County Medical Society has elected Dr. C. H. Otken, Paige, President; Dr. George M. Jones, Smithville, Vice-President; Dr. T. B. Taylor, Bastrop, Secretary. All were re-elected.

Bee County Medical Society has elected Dr. A. J. Turner,

(Continued on page 48)

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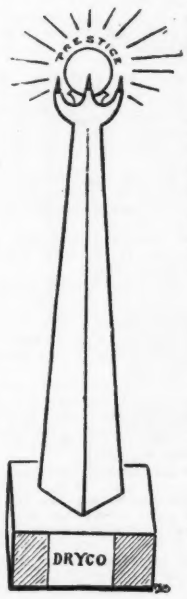

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(Continued from page 46)

Beeville, President; Dr. C. M. Poff, Tuleta, Vice-President; Dr. S. E. McNeill, Beeville, Secretary.

Bexar County Medical Society has elected Dr. S. P. Cunningham, President; Dr. J. S. Steele, Vice-President; Dr. R. Stuart Adams, Secretary; Dr. E. C. Scull, Treasurer.

Clay County Medical Society has elected Dr. W. F. Cook, Bellevue, President; Dr. J. A. Allison, Henrietta, Vice-President; Dr. J. H. Ferris, Henrietta, Secretary.

DeWitt County Medical Society has elected Dr. L. W. Nowierski, Yorktown, President; Dr. J. R. Frobese, Cuero, Vice-President; Dr. B. J. Nowierski, Yorktown, Secretary-Treasurer.

Hunt County Medical Society has elected Dr. P. W. Pearson, Emory, President; Dr. C. T. Bradford, Commerce, Vice-President; Dr. Henry W. Maier, Greenville, Secretary-Treasurer.

Potter County Medical Society has elected Dr. G. T. Vineyard, President; Dr. A. E. Winsett, Vice-President; Dr. Richard Keys, Secretary-Treasurer.

Williamson County Medical Society has elected Dr. Ed Doak, Taylor, President; Dr. H. A. Scott, Hutto, Vice-President; Dr. W. G. Pettus, Georgetown, Secretary.

The Twelfth District Medical Society met in Temple January 8-9. The following officers were elected: Dr. G. S. McReynolds, Temple, President; Dr. L. R. Talley, Temple, Secretary-Treasurer.

The Twelfth District Ladies' Auxiliary met with the Twelfth District Medical Society January 8. The following officers were elected: Mrs. G. S. McReynolds, Temple, President; Mrs. Lee Knight, Temple, Vice-President; Mrs. J. W. Torbett, Marlin, Secretary; Mrs. G. V. Brindley, Temple, Corresponding Secretary.

The North District Medical Society will meet in Decatur June 24-25.

The State Public Health Association met in Austin February 16. The following officers were elected: J. W. Butler, President; Dr. Joseph B. McKnight, Sanatorium, Vice-President; Dr. Zachary T. Scott, Austin, Secretary.

A hospital company of the Thirty-sixth Division, Texas National Guard, will have headquarters in Athens. The company will have sixty men, including officers and en-

(Continued on page 50)

ANNOUNCEMENT

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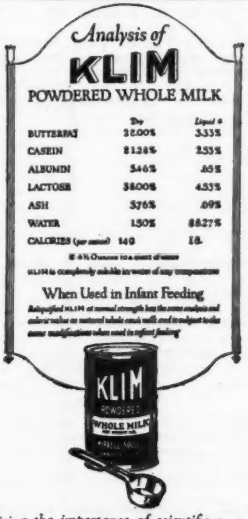

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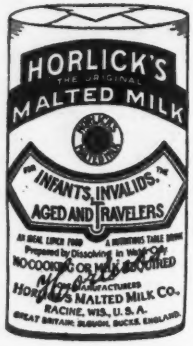

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(Continued from page 48)

listed men. Dr. J. K. Webster will be Commanding Officer.

The Masonic Hospital, El Paso, has been entered on the list of standardized hospitals by the American College of Surgeons.

The new Parkland Hospital, Dallas, erected jointly by the City and County, was formally opened January 1.

Mrs. M. T. Overall has created a permanent endowment fund of $50,000 to the Overall Memorial Hospital, Coleman, to be vested in the trustees of the Hospital. This is in the form of vendor's lien notes to the amount of $43,432.96, and the donor's personal note for $6,567.04, providing that 10 per cent of the net revenues arising from the permanent endowment fund shall be added annually to the permanent fund until the additions to the fund have reached $100,000. Mrs. Overall is the donor of the Overall Memorial Hospital.

The Waite Pathological Club, El Paso, a new institution for medical study, was recently organized. The membership is limited to twelve.

Dr. Elliott C. Prentiss, El Paso, and Miss Ethel I. Owbridge, Santa Monica, Calif., were married December 20.

Dr. William Peyton Rogers, El Paso, and Miss Lula B. Adams were married December 26.

Dr. William Arthur Toland, El Paso, and Miss Grace B. Terrill, Boston, Tex., were married November 26.

Deaths

Dr. Hardy C. Black, Waco, aged 69, was found dead February 17 from cerebral hemorrhage.

Dr. J. K. F. Bowen, Dallas, aged 64, was found dead in his office January 19.

Dr. Finis Jackson Dickey, Dallas, aged 69, died February 14.

Dr. J. K. P. Poindexter, Kosse, aged 82, died January 9 from senility.

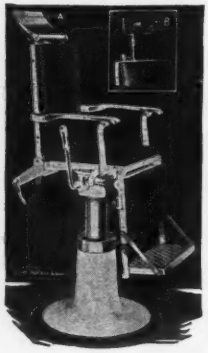
VIRGINIA

Albemarle County Medical Society has elected Dr. Percy Harris, Scottsville, President; Dr. W. E. Bray, University, Vice-President; Dr. F. C. McCue, Charlottesville, Secretary-Treasurer.

Alleghany County Medical Society has elected Dr. W. H.

(Continued on page 52)

FOR THE DOCTOR'S OFFICE



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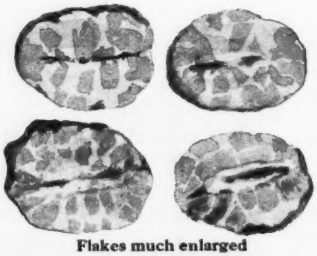

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(Continued from page 50)

F. Miller, Clifton Forge, President; Dr. J. V. Jordan, Covington, Vice-President; Dr. R. P. Hawkins, Jr., Clifton Forge, Secretary; Dr. W. M. Revercomb, Clifton Forge, Treasurer.

The Virginia Tuberculosis Association, at its meeting in Richmond, January 18, elected Dr. Charles R. Grandy, Norfolk, President; Dr. Ernest C. Levy, Richmond, Vice-President; Dr. William M. Smith, Alexandria, Secretary.

The Loudoun Confederate Veterans have elected Dr. C. F. Russell, Herndon, Commander; Dr. J. E. Copeland, Round Hill, Surgeon of the Camp.

On February 2 there were presented to Battle Abbey (the Confederate Memorial Institute), Richmond, bronze busts of two of Virginia's most renowned and beloved members of the medical profession, Dr. Hunter Holmes McGuire and Dr. Rawley White Martin.

Dr. E. L. Sutherland has taken charge of the Nansemond-Suffolk joint county and city health unit, succeeding Dr. I. C. Riggin, resigned.

Drs. W. C. Powell and F. J. Wright, Petersburg, have been elected members of the Board of Directors of the Banking Trust and Mortgage Company of that city.

Drs. M. L. Anderson and J. R. Blair, Richmond, have been elected among the directors of the Systematic Savings Corporation of that city.

Drs. Jeffrey N. Elder and William S. Woody have been appointed members of the Hopewell Board of Health.

Dr. G. G. Hankins, Hampton, has been appointed on the staff of the Philadelphia General Hospital, Philadelphia, Pa.

Fire of unknown origin destroyed the central portion of the main building of Memorial Hospital, Winchester, January 18. The loss was approximately $100,000 and was partially covered by insurance.

Mr. W. L. Lucas has been appointed Manager of Hygeia Hospital, Richmond. The Hospital is owned and operated by Dr. J. R. Blair.

Dr. W. C. Caudill, Pearisburg, has been elected a member of the Board of Directors of the First National Bank.

Dr. Lawrence T. Price, Richmond, has been elected Commander of Stonewall Jackson Camp, No. 981, Sons of Confederate Veterans, and Dr. P. D. Lipscomb, Richmond, has been re-elected Surgeon.

Dr. E. D. Woodard, Bayboro, N. C., is in charge of a Health Unit in Isle of Wight County.

Miss Martha Baylor, for the past five years Superintendent at St. Luke's Hospital, Richmond, has resigned. Miss Elizabeth Hendricks succeeds her.

Dr. Horace Orlando Bell, Richmond, and Mrs. Alice Arlina Streit, New York, N. Y., were married recently.

Dr. Harry Lee Claud, Newport News, and Miss Julia Marvin Sarvey, Norfolk, were married January 5.

Dr. Lawrence O. Snead, Richmond, and Miss Empsie Shapard, Halifax, were married February 9.

Deaths

Dr. Claybrook Fauntleroy, Dragonville, aged 64, died at the home of his sister in Richmond January 10.

Dr. Paulus Fitz James Miller, Virginia Beach, aged 69, died January 19 following a long illness.

Dr. Walter S. Roy, Front Royal, aged 83, died in Feb-

(Continued on page 54)

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This breaks the food cells — makes them easy to digest. The whole grain elements are richly fitted to feed.

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You appreciate the vital importance of pure and fresh drugs—drugs that are prepared and packed under certain government regulations.

How about foods? Aren't they just as important? Take baking powder, for instance—it is useful only when it produces its maximum of leavening strength in the baking. Leavening efficiency means light, wholesome breadstuffs—bakings that are easily digested, which in turn aid towards perfect health. Lack of leavening strength means flat and soggy bakings which are surely indigestible.

The pure food laws of our country have standardized baking powder—they require that it contain 12% leavening gas at the time of sale to the consumer. Why is it that these laws have not been applied to baking powder when mixed with flour and sold in cotton sacks?

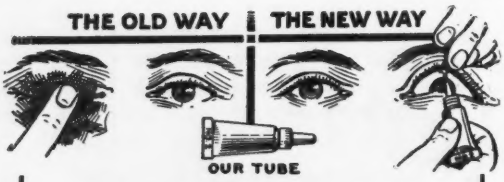
Thousands of barrels of self rising flour are annually sold in our southern states without regulation by pure food measures, with the exception of Texas.

Any grade of flour and any quality or strength of baking powder can be used in so-called self rising flour mixtures and sold to the unthinking public without official criticism or regulation.

Numerous baking and laboratory experiments have been conducted by state chemists and other investigators. They found a surprising amount of this mixed flour to be so deteriorated as to be productive only of heavy, soggy bakings.

Do you want your patients to eat foods made from self rising flours that do not contain the necessary leavening strength—foods that are hard to digest and a detriment to health? Do you want the law to protect the consumer in this instance as it protects the user of drugs? It is for you and others interested in public health to decide.

Remember Calumet Baking Powder meets every requirement of the law—that it retains its great leavening strength to the last spoonful. Packed in tin—keeps the strength in.



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(Continued from page 52)

ruary from senility.

Dr. Theodore Frederick Reusch, Lynchburg, aged 39, died February 11.

WEST VIRGINIA

The West Virginia State Medical Association will hold its meeting in Wheeling May 13-15.

Eastern Panhandle Medical Society has elected Dr. W. H. Crum, President; Dr. B. B. Ransom, Harper's Ferry, Vice-President; Dr. James K. Guthrie, Secretary.

Under the auspices of the local Anti-Tuberculosis Society, with the cooperation of the Eastern Panhandle Medical Society, Dr. Gordon Wilson held a Tuberculosis Clinic in Martinsburg January 19.

The new St. Luke's Hospital has been formally opened in Bluefield. Dr. C. M. Scott, assisted by Dr. T. E. Vass, is in charge of the Surgical Department, and Dr. R. H. Hoge is in charge of the Medical Department. The Hospital is thoroughly equipped with radio, each bed being provided with a headpiece, and the system is so devised that when a patient has callers, all who care to may "listen in."

Cancer clinics have been opened at the Ohio Valley General Hospital and the North Wheeling Hospital, Wheeling.

Contracts have been awarded for the construction of the Hall of Chemistry for the University of West Virginia, Morgantown. It will be erected at a cost of $750,000.

Dr. R. A. Ashworth, Moundsville, President of the State Medical Association, has appointed the following members to compose the Committee on Medical Education: Dr. J. N. Simpson, Morgantown, Chairman; Dr. W. T. Henshaw, Charleston, Dr. W. S. Fulton, Wheeling. He reappointed the Hospital Committee as follows: Dr. Charles M. Scott, Bluefield, Chairman, Dr. Frank LeMoyne Hupp, Wheeling, and Dr. A. P. Butt, Elkins.

Deaths

Dr. Henry Hugh Bryan, Logan, aged 71, was killed January 27 when struck by a train.

Dr. Park W. McClung, Elizabeth, aged 55, died recently following several months' illness.

Dr. Edmund B. Fittro, Salem, aged 53, died suddenly in his office January 15.

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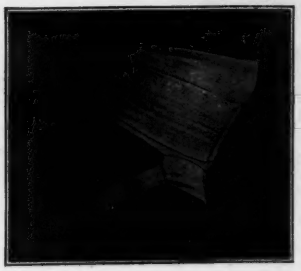

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SOUTHERN MEDICAL JOURNAL

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